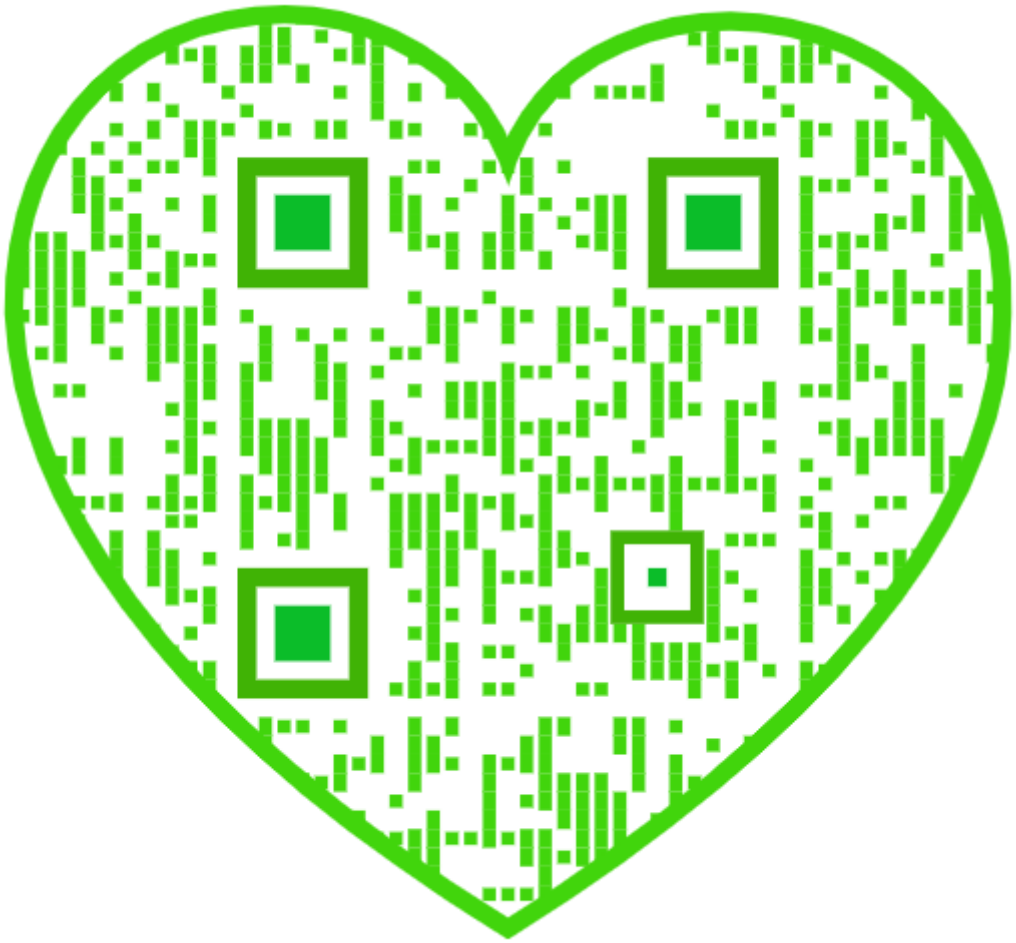

ALICE AMELIA HAGERMAN,
FIRST TWILIGHT BABY BORN AT MARY THOMPSON HOSPITAL, JUNE 3, 1914.

Scopolamine-Morphine Anaesthesia

BY

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Chicago Medical Society, Etc.

AND

A Psychological Study of "Twilight Sleep" Made by the Giessen Method

BY

ELISABETH ROSS SHAW
Consulting Psychologist

THE HOUSE OF MANZ
CHICAGO

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TO MY SISTER

PREFACE

T the Tri-State Medical Society, which was held at Des Moines, October 13 and 14, 1914, I read a paper the content of which is embodied in this little book. It provoked much discussion and was adversely criticized by many physicians who had had no personal experience in the use of this anæsthesia. On the following Sunday the Des Moines "Register and Leader" gave a full report of the paper and discussion. This was criticized by Dr. Hutchins of Des Moines on the following day. In reply, Dr. Arthur J. Booker wrote the following:

"It is less from a desire to enter a controversy than to come to the rescue of my friend, Dr. Bertha Van Hoosen, that I reply in this manner to the genial, and in some respects, so far as 'twilight sleep' is concerned, correct Dr. Hutchins.

"Those who think Dr. Van Hoosen's enthusiasm over morphine and scopolamine to have begun with McClure's magazine are all amiss. Eight years ago I had the opportunity as an interne to see the doctor use this method for a year and a half. About three years ago she used it here in a big clinic, with excellent result, as characterizes her work. She is one of the many competent surgeons to stick

by this method and prove its worth, as is necessary with any new proposition.

"This method of anæsthesia is based upon sound surgical principles, which have been made very definite, by no less eminent surgeon and philosopher than Dr. George Crile of Cleveland, who is the world authority upon anoci-association. It has the indorsement of Bloodgood and a coterie of men who are lights in surgery. As Dr. Hutchins well stated, it has been used for years by men who pretend to keep up with advances in medicine, and no fuss was made about it. 'Twilight babies' have been born all over the country for years and nothing was said about it, because most men are more concerned to meet conditions and get results than to deal with names.

"Now let us make a brief analysis: If this anæsthetic is a good thing in a large clinic such as Crile has, as Bloodgood is furnished with, and we will say, for sake of argument, as Dr. Van Hoosen claims—leaving out other examples—what is the objection to its use in obstetrics? Some men lay great stress on the occasional asphyxiated babies; but the most hostile critics do not claim that these same babies do not grow up to make third grade. After any anæsthetic, used for a period long enough to make the mother unconscious, we expect more or less asphyxia. Every well equipped obstetric bag is furnished to meet this condition, even by

men who do not use this method, and before it was used. No one has discovered that a little asphyxia hurt the child.

"Whether it be ether, chloroform, scopolamine or any one of the various anæsthetics which is used, nothing is going to take the place of brains and judgment on the part of physicians. There are idiosyncrasies and contra-indications to nearly every drug we know and no anæsthetic is administered without serious thought on the part of the attendant.

"Dr. Van Hoosen needed no popular article to make her enthusiastic about a method she has used with striking success for ten years, as her pupils and those who attended her clinic can attest. Quite the contrary to Dr. Hutchins' belief, scopolamine was never so popular as today. It is not a depressant to the circulatory apparatus; quite to the contrary, it seems to stimulate the heart by its action on the vagus nerve. Men who give much choloroform or ether after the administration of scopolamine clearly prove that they do not understand the principles. It does not irritate the kidneys as do some other anæsthetics, as may be proven by laboratory analysis. As for the milk, this is stimulated to flow because the mother has not been so exhausted and the flow of blood to the glands is better and the stimulation of nursing causes a better secretion as a result. If we depended on the Almighty to look after the milk entirely all the babies would be better off.

"The depressing effect of this anæsthetic is almost nil, even when given in the full amount, as there is no time when the patient cannot be aroused; after the advent of labor the mother is usually in a refreshed condition.

"Dr. Van Hoosen did not take her own cases covering a period of years as the basis of her paper, but the last fifty cases in the Mary Thompson Hospital—where this anæsthetic is used—and the last fifty at the County Hospital, where it is not used. Her comparisons were rather those of a disinterested party than of an enthusiast. Her conclusions were fair. She thinks it is excellent, as do thousands of other physicians throughout the country; but in the final analysis it is a question for the attending man and not the patient to decide.

"If the mothers live and the children do not die—and the most virulent critics admit this—it does not matter if the baby does not keep the neighbors awake the first night.

"It took a queen to make chloroform popular; and since we have no queens in this country perhaps it depends upon the women physicians and the mothers to exercise their sovereignty."

At the request of friends like Dr. Booker, and to fortify my position before my critics, I have been led to write my views and my experience with the anæsthetic so recently christened "Twilight Sleep."

P R E F A C E

I am indebted to Dr. Anna Handshaw and Dr. Josephine McCollum for statistics and collateral reading. Dr. McCollum has been special anæsthetist to Mary Thompson Hospital for many years and was the first to administer it in the Gynæcological Clinic in the Illinois State Medical School. Dr. Handshaw administered it in the same clinic for a period of eight years. She also wrote the chapter on "Pharmacology, Toxicology and Physiological Action." Both have given valuable suggestions and opinions for other chapters.

Drs. McCollum and Handshaw were experts in chloroform and ether anæsthesia before giving any attention to scopolamine-morphine anæsthesia.

Dr. Pearlie Mae Stettler has compiled the Bibliography and Drs. Mulcahy, Ackerman and Gardner have given valuable assistance in developing the present method of Twilight Sleep Delivery at the Mary Thompson Hospital during their obstetric service.

Dr. Maud Ethridge, Miss Jane Parmlee and Miss Clara Stuart have contributed many hours' work in collecting records.

The 5,000 cases reported include nearly all of my operations during the past ten years, with operations by Drs. Mary Gilruth McEwen, Mary Jeanette Kearsley, Clara Ferguson, Bertha Bush and Nora Johnson.

P R E F A C E

Without the assistance of these women it would have been impossible to produce this report. I take this opportunity of expressing my appreciation of their work.

BERTHA VAN HOOSEN.

32 North State Street, Chicago.

Scopolamine-Morphine Anaesthesia

CHAPTER I

INTRODUCTION

IN the Fall of 1904 I saw Dr. Emil Ries of Chicago use scopolamine-morphine anæsthesia in his clinic. It was the first time that I had ever seen a patient under any anæsthesia except chloroform, ether or gas. I was then using continuous gas anæsthesia with great success, but the enormous expense attached to the gas anæsthesia, together with the necessity of having for an assistant a person who was not only trained to administer it, but who was also of an alert and self-reliant disposition, made me ever ready to take up something more practical as soon as it could be found.

No novice at a spiritualistic seance could have been more deeply impressed than I was at that first clinic. I felt as deeply impressed as though I had never seen a patient under any anæsthetic. Natural sleep, death, hypnosis, catalepsy and intoxication all seemed to be blended into a composite making up the wonderful "Twilight Sleep."

One of my little patients—a girl of fourteen, who had nearly lost her life under a short choloroform anæsthesia given simply for an examination, and on this account was

dreading an operation for recurrent appendicitis—had asked me if there was any anæsthetic "where the mind would go to sleep first and wake up last?" This was a description of scopolamine-morphine anæsthesia, and under its refreshing sleep this young girl went safely through her operation.

At the time that I first saw this anæsthesia used I was occupying a clinical chair in the College of Physicians and Surgeons. My clinics were in the college amphitheatre and the patients were cared for at the West Side Hospital, which was connected with the college building by a bridge over the adjacent alley. At the end of the first year of my professorship the West Side Hospital authorities refused to admit my patients, and I was forced to improvise a hospital from a store and an adjoining flat just across the street from the hospital. The strain on clinic patients is always great and immeasurably so when they must be transported in all kinds of weather across a noisy street and up a college elevator to a college amphitheatre. It was to relieve this strain that I introduced scopolamine-morphine anæsthesia as routine for all my surgical patients in my clinic. This clinic was held on Saturdays from 8:00 to 10:00 a. m., and every patient who was to be operated on that day received an injection of scopolamine-morphine at 5:30, 6:30 and at 7:30 o'clock and at 8:00 were so deeply asleep that the ride in the ambulance to and from the college, the examination by

the students, the operation and everything that happened from two to six hours after the operation were all a blank. For the first three months I was forced to give the hypodermic injections myself because of the fear the nurses held for the drug.

To do this I arose at 4:00 a. m. and traveled ten miles to administer the first dose at 5:30. It was not long, however, before our nurses were quite enthusiastic and willing to undertake the administration of the injections.

I also began at that time to use it in all my private operations at the Woman's Hospital. But here also, on account of the prejudice of the superintendent of nurses, the nurses were not allowed to give the hypodermic injections, and they were given by the internes. It was about this time—in 1906—that the Board of Women Managers of the Frances Willard Hospital refused to allow me to use scopolamine-morphine in their hospital and I received a letter from the President of the Board to that effect.

Other hospitals, though they did not actually refuse, showed such disapproval of my anæsthetic that its administration was made very burdensome to me.

I know of no other instance where nurses were not allowed to carry out a doctor's orders or where lay members of a board of trustees ventured to criticize a surgeon's choice of an anæsthetic.

SCOPOLAMINE-MORPHINE ANAESTHESIA

One of the most encouraging things has been that the internes in the hospitals where I have worked and the physicians on whose patients I have operated have never had anything but praise, confidence and admiration for this anæsthetic. I have operated upon twenty-eight women physicians and more than one hundred nuns under this anæsthetic, and no one of them ever hinted a fear of it. Six years ago I had the pleasure of demonstrating scopolamine-morphine to Dr. Mary Smith of Boston, from whom I received my first instruction in surgical technique. She at once introduced it at the New England Hospital for Women and Children, where it has since been in use. Many of my students have reported its satisfactory use in the foreign field where assistants were scarce and chloroform and ether difficult to transport.

More than fifty nurses have had operations under this anæsthetic, for it is, after all, the nurse who most appreciates its advantages.

Scopolamine-morphine anæsthesia converts the day of operation from an anxious, disagreeable day to the quietest day in the hospital.

CHAPTER II

Pharmacology, Toxicology and Physiological Action of Scopolamine-Morphine

COPOLA was obtained in 1889 by Banger and again in 1890 by Dr. Schmidt, who named the plant Scopola for his friend, Dr. John Scopoli, of the University of Pavia.

It is a dried rhizome of Carnolacea Jacquin, of the family Solanacea, a perennial plant of horizontal growth about a foot high, distinguished botanically by its fruit being a transversely dehiscent capsule, thinner leaves than belladonna—which it resembles—and is also distinctly rhizome, the roots lying above the ground and sending their tendrils downward into the earth. It exhibits a yellowish-white bark, its corky layer dark brown or pale brown; its wood is distinctly radiate and central pith rather horny; nearly inodorous, taste sweetish at first, then after taste bitterish and strongly acrid. The plant is common in Bavaria, Austria-Hungary, South Russia and Northern United States.

Scopola contains an alkaloid named scopolamine called a natural amine N_3 base. Most alkaloids occur naturally as nitrogen bases. Where the N_2 or N_3 is found as a nitrogen base the name is amine. Hence Scopola is called an amine. Scopolamine hydrobromide has chemical form-

ula $C_{17}H_{21}NO_4H_2OBr$, and it contains also a hydroiodide and hydrochloride, as well as apoatropine. Scopolamine is levarotary, deviating the plane of polarization to the left; has an optical rotation varying from twenty degrees to as low as two degrees, has the independent atroscin (and an impurity apoatropine), to which is due its physiological identity and much of its therapeutic action. Of the fluid extract of scopolamine evaporated, dose is grains ⅛ to ½; percolated with alcohol 8, water 2, dose is ½ to 1 grain. Extract of scopolamine (United States Pharmacopœia) contains two per cent of mydriatic alkaloid; dose of fluid extract m½ to 3 contains 0.5 g. m. of mydriatic alkaloid and is now officinal in the eighth edition of the United States Pharmacopœia of 1905. Scopolamine appears in the form of prismatic crystals fusing at 138° F. (58° C.), soluble in water, alcohol and ether.

It degenerates rapidly when exposed to the air or light, and should therefore be used in fresh solutions; it is best administered hypodermatically.

Scopolamine with its chemistry is a most interesting study. Dr. J. W. Hassler, of New York, in an article of 1906 entitled "Why Scopolamine?" gives the experience of a chemist of a leading New York house, who told the doctor of examining six specimens of scopolamine produced

by six firms respectively. The analyses showed a variation in strength of each specimen due to the presence of a greater or less degree of atropine, atroscin and apoatropine —arriving at the following conclusion: Commercial scopolamine is unfit for use as an anæsthetic.

Merck has prepared a tablet grains 1/100 which is uniform in strength and in alkaloidal purity.

Scopolamine could not be discussed without a reference to its companion and understudy, hyoscine and belladonnæ, which are also of the Solanacea. Hyoscyamus as a synonym, because by some workers it has been thought to be isomeric, has caused so much of confusion and lack of scientific acceptance of scopolamine that I have searched most diligently to differentiate it from hyoscine. The Henbane is a very different plant, and according to Ladenburg has not an isometric identity, as its chemical formula is $C_{17}\,H_{23}\,N_3O\,Br$—which gives a different chemical composition. Hyoscyamus niger has a uniform optical radiation of minimum twenty degrees and is dextra rotary. Then, too, hyoscyamus is non-crystalline and is of a sirupy consistency, while scopolamine is crystalline. We can see that even macroscopically the two substances differ from each other. Notably enough, these most marked basic distinctions provide, when assayed as directed, the above percentage of the pure alkaloid as quoted and the purity of

scopolamine can be tested. A drop of potassium permanganate is added to the solution to be tested. If scopolamine with atropine alone are present no change occurs; if apoatropine, as much as 1/20,000 is present, a brownish-yellow color is produced by the formation of oxide of manganese.

The German Pharmacopœia uses scopolamine as officinal. The British Pharmacopœia uses it as a synonym for hyoscyamus. The United States Pharmacopœia uses scopolamine distinct from hyoscin and as officinal. Then the great difference between scopolamine and hyoscin is in its therapeutic and physiological activities, the latter provoking the phenomenon of intoxication, while the former does not.

In Waugh-Abbott we find the following:

"It is well to remember that all those authors who propose this identity of the two drugs speak of the hyoscin of commerce—that is, German hyoscin." Now our readers well know from numerous previous proofs that an alkaloid pure, and chemically definite, is far from a product delivered by German commerce under the name of an alkaloid. We do know from our earliest lessons in chemistry that the diamond is nearly pure carbon and that charcoal is also nearly pure carbon—the diamond is alliotropic with carbon and chemical formula identical—

but we do not quote them as being the same; why should we think of these two alkaloids, scopolamine and hyoscyamus, as being the same?"

PHYSIOLOGICAL ACTION

SCOPOLAMINE		MORPHINE
Antagonistic Action	**Synergistic Action**	**Antagonistic Action**
Elevates temperature....	.....	Lowers temperature.
Quickens respiration.....	.....	Slows respiration.
Increases urinary secretion.....	.....	Slightly diminishes urinary secretion.
Increases peristalsis.....	.....	Diminishes peristalsis.
Arrests skin and salivary gland secretion.....	.....	Sudorific.
Dilates pupil.....	.....	Contracts pupil.
Raises blood pressure....	.....	No effect on blood pressure.
Stimulates vaso motor centers.....	.....	No effect on vaso motor centers.
Increases rapidity and force of circulation....	.....	No effect on circulation.
Excites motor areas of spinal cord.....	.....	Depresses motor areas of spinal cord.
.....	Relieves pain.	.....
.....	Induces sleep.	.....

Therapeutics: Scopolamine is indicated wherever a mydriatic, antispasmodic, somnifacient, analgesic, hypnotic, narcotic, anodyne, anticonvulsant, or where a general anæsthetic is needed.

Its first field of usefulness was that of the ophthalmologist, as early as 1895. As a collyrium of 0.2 per cent its mydriatic effect upon the ciliary muscle is evidenced by the widely dilated pupil seen within two minutes after the drug has been instilled into the conjunctiva. The duration of its action is about the same as atropine, paralyzing accommodation for a few days.

Dr. Schneiderlin, an alienist, used scopolamine in 1900 to produce sleep in the restless insane and afterward successfully combined it with morphine to produce surgical anæsthesia for operative work upon demented patients, as it helped to allay motor activity.

In 1901 Steinbuchel first used the drug in obstetrics and from it gained much assistance. These first years of its usefulness were confined to Europe. Its clinical use in the University Women's Hospital of Freiburg by Drs. Kroenig and Gauss is well known to all physicians.

From 1904 to 1906 it began its interesting career in America with a growing number of adherents and enemies throughout the United States, every one of these adding an interesting chapter to its history.

SCOPOLAMINE-MORPHINE ANAESTHESIA

Morphine sulphat synergist with scopolamine seems to be the best adapted to surgical anæsthesia. The patient sleeps but cannot always be kept sufficiently quiet for operative purposes without novocain, chloroform or ether.

Toxicology:

The lethal dose of morphine is known to all; the lethal dose of scopolamine is not known. Two grains were given by Dr. Bryant in a test case, in three doses of two-thirds grain each, an hour apart, and he says that although he had interesting symptoms, the dose was not fatal.

Kochman gave 30 grains intravenously to a 15-pound dog without fatal results.

Scopolamine-morphine anæsthesia has great advantages—both ante- and post-operative—to the patient, the surgeon, the anæsthetist and the nurse.

If the degree of anæsthesia at the time of operation is insufficient, use chloroform or ether in small quantities as an adjuvant.

Though the pupil is no guide in scopolamine-morphine surgical anæsthesia, there are other and as definite and safe ones to be kept under the observation of the anæsthetist: Watch the face for its danger signals of pallor or cyanosis, the respiratory excursion of the thorax and abdomen for any change. Keep your finger on the pulse (facial or radial artery).

When asked what is to be done if trouble arises from the anæsthetic, I should say something was done when you gave the hypodermic injections, as the drugs scopolamine and morphine are antagonistic and antidotal, and very little is left to be done.

For cyanosis, flex the head on the chest to induce deep breathing, and give oxygen. If respirations are slow, or rapid and shallow, give oxygen.

For a small, weak, rapid pulse, give hypodermoclysis, strychnine, alcohol or digitalin hypodermatically.

There are certain diseased conditions of the patient which if present should make the watching more keen on the part of the anæsthetist. Watch carefully a patient with incipient tuberculosis; the second stage of tuberculosis is a call for a double watch, and little morphine should be given.

In none of the degenerative diseases of the renal organs should an anæsthetic be given, including scopolamine-morphine.

Functional diseases of the heart do not preclude scopolamine-morphine anæsthesia. Organic diseases of the heart may, although we have had many with organic heart diseases take the anæsthetic successfully.

If the patient has suffered from either sepsis or hemorrhage, there will probably be more need of care, such as

hypodermoclysis and heart stimulants during the operation to save the strength of the patient, or extra post-operative care.

These precautions apply no more to this anæsthetic, however, than to all others.

In any surgical operation scopolamine-morphine is the anæsthetic of selection because it shortens duration of administration and amount of chloroform or ether and so prevents cell death. Dr. Crile tells us that this and anoci prevent shock.

The great number hostile to scopolamine is impressive—first, because when asked what they think of it they will tell you they do not use it, as it is dangerous; second, because some one else who has not used it says it is dangerous; third, if they have used it they seemingly had no method, and if they met with danger signals, abandoned its use as unsafe. I believe, with several of its adherents, that the burden of the proof of its efficiency, safety and future usefulness lies with its exponents—not its opponents—and these 5,000 cases surely are one of the weights of the burden of proof.

Chloroform—the most perfect of anæsthetics for general inhalation and one of the most safe—has its enemies and had its struggle upward through the light; and it has its limitations. Some individuals should never be given

chloroform. Some individuals (however trained) should never give chloroform. The same moralizing applies to the same extent, though for different reasons, to ether. The profession does not condemn chloroform and ether in toto; but their limitations lead us to search for another and better anæsthetic, and we have found it in scopolamine-morphine.

To the chemist of the future we must look not for the commercial scopolamine, but for the special preparation that shall excel for purity and strength, so that when we purchase scopolamine hydrobromide we shall not have either apoatropine or atroscine to reckon with. Then it will be the anæsthetic of our dreams, made perfect through our struggles for efficiency.

CHAPTER III

Administration for Surgical Anaesthesia

IN my early work with scopolamine-morphine anæsthesia I followed the technique laid down by Dr. Emil Ries. I gave morphine ½ grain and scopolamine 1/50 grain in three equally divided doses: first dose given hypodermatically two and one-half hours before operation, second dose one and one-half hours before operation, third dose one-half hour before operation. I used this dosage for two years, when through a mistake of an interne—in miscalculating that 1 minim equaled 1 drop—I found that I had been unknowingly giving morphine ¾ grain and scopolamine 3/100 grain in three equally divided doses to each patient for at least two months; it had brought no harm to the patients and was much more satisfactory than the smaller dosage. This dosage I have continued to use for the past seven years.

In the importance of having a clear alimentary tract, of having the mind of the patient calm and free from worry, and a room that is quiet for the administration of the anæsthesia, this anæsthetic is similar to all others. Where we used the small doses (morphine 1/6 and scopolamine 1/150 repeated three times one hour apart), we were obliged to use chloroform, ether or gas as an

adjuvant in ninety per cent of the cases. The amount of the adjuvant depended upon the nervous condition of the patient, the character of the operation and the familiarity of the anæsthetist and operator with the details of the anæsthesia.

With the larger doses (1/100 scopolamine and ¼ morphine repeated three times one hour apart), from sixty per cent to seventy-five per cent needed no adjuvant to deepen the anæsthesia for minor operations. The exceptions hemorrhoidectomy and perineorrhaphy. In major operations twenty-five to forty per cent needed no adjuvant.

We have given prolonged trials to ether, gas and chloroform as adjuvants to scopolamine-morphine anæsthesia, and both Dr. Handshaw and I prefer chloroform, while ether is Dr. McCollum's favorite.

Gas is not practical, because a skilled anæsthetist and a special expensive apparatus is necessary for its administration. Then, too, even a little carbondioxide increase in the blood is highly undesirable in scopolamine-morphine anæsthesia, because if any unusual complication or cause for anxiety arises it will come from a slowed respiration or a tendency to cyanosis. At St. Luke's Hospital, Chicago, where an expert anæsthetist and a special apparatus for giving gas and oyxgen are always at hand and where the patients receive the scopolamine under most favorable

conditions in a private room with darkened windows and entire absence of noise, the administration of gas has been highly satisfactory; but these conditions are so rarely obtainable in routine work that gas is not advised as an adjuvant.

The chloroform has many advantages; it does not irritate or congest the respiratory passages (as does ether), and patients do not resist its initial administration as they do that of ether; it is used in much smaller amounts and with greater admixture of air; its action is more rapid, there is less chance of irritating the kidneys and slightly smaller percentage of post-operative vomiting. It must be remembered that chloroform as an adjuvant is not administered as chloroform is administered when given alone, but intermittently more in the manner of an obstetric anæsthetic. When the operator and the anæsthetist work harmoniously together the anæsthetist will know when the operator is going to make such manipulations that a little chloroform will be required and will have given that small amount at the right moment and at other times when the manipulations do not disturb the patient she will allow her to sleep without administering chloroform.

Very few patients do not resent the initial administration of ether, even though apparently deeply under the influence of morphine-scopolamine. So if it is thought best to give

ether instead of chloroform as an adjuvant, it is wise to give enough ether to put the patient to sleep before adjusting the sterile sheets, and to continue to give it in exceedingly small amounts during the operation. Letting the patient come out of the ether anæsthesia will necessitate another rebellion on the part of the patient and possibly at a critical point in the operation.

During the past year all of our operations have been done under local anæsthesia (the anoci of Crile) combined with the morphine-scopolamine anæsthesia. This combination gives perfect results.

In eighty per cent of major operations and in ninety-five per cent of minor operations no ether or chloroform will be needed. With it we have greater freedom from post-operative pain and vomiting. Patient after patient, when ready to leave the hospital, is asked, "Have you had any pain since your operation?" and the answer is invariably, "No"; or, "None to speak of."

Morphine-scopolamine is most successfully administered in the early morning while the patient is still sleepy. With nervous patients I have found it most satisfactory to have the patient spend the evening preceding the operation at the theatre; the nurse may finish the preparation on the return of the patient from the theatre.

Rules for a successful anæsthesia:

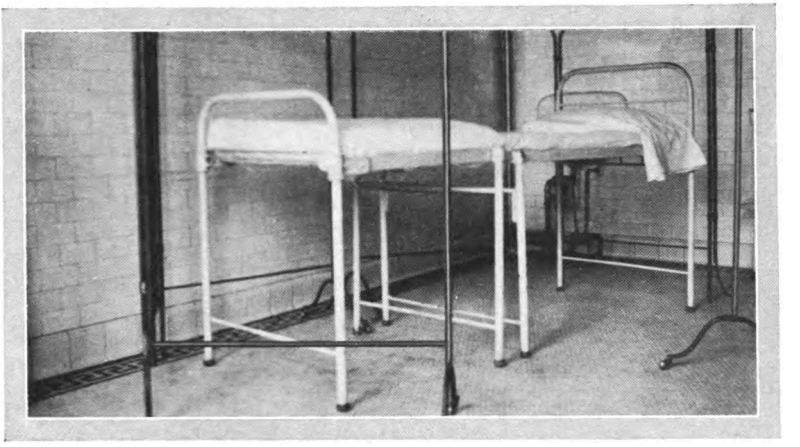

PLATE I. SECTIONAL DELIVERY BED. (*Closed.*)

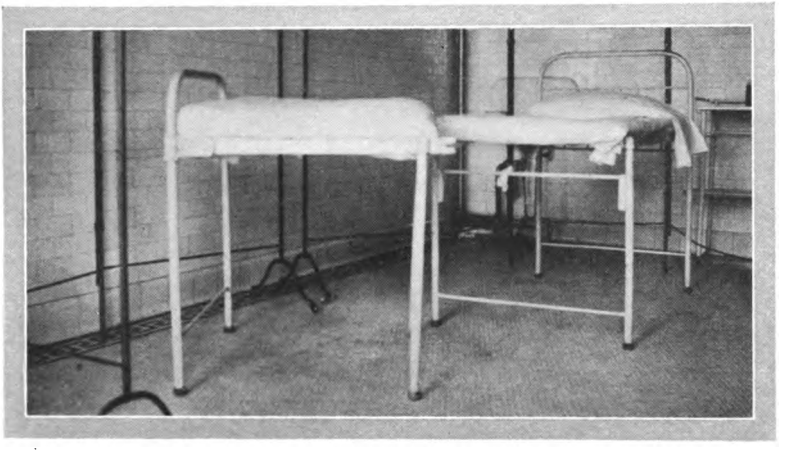

PLATE II. SECTIONAL DELIVERY BED. (*Open.*)

1. Nothing should be done in the way of preparation after the first dose is given.

2. The patient must not be seen or spoken to by friends or questioned by nurses or doctors after the first dose.

3. Make the patient's mind as free from anxiety and worry as possible. If she wishes to remain awake to speak with some one and it is not possible to arrange this, refuse positively so that she will not fight the sleep sensations to accomplish her desire.

4. Draw the shades, make the patient comfortable and leave her alone in her room for at least one-half hour after the first dose.

5. Take to the operating room on a cart and do not allow or ask the patient—even though apparently awake—to make any effort toward getting on or off the cart. Lift gently and transport carefully after having placed a towel over the patient's eyes and cotton in her ears if the surroundings are noisy.

6. Nurses must report any leakage of hypodermic syringes and must use fresh tablets and never a stock solution.

7. To give the hypodermic injections use this method: Sterilize water in a spoon and draw into the syringe three-fourths of the amount necessary to fill it. Place the hypodermic tablet in the sterile spoon and inject over it

the contents of the syringe. Dissolve thoroughly and use great care to suck up all of the solution. Free the syringe from air, but do not lose a drop of the solution by so doing. Inject deeply and inject every drop. If these precautions are not taken, it is easy to start with ¼ grain of morphine and give the patient ⅛ grain, and the surgeon will consider the drug variable and unreliable.

8. The nurse need not be in constant attendance on the patient until the latter is conscious, but the patient must be seen at least every fifteen minutes during the first four hours and every half-hour for the next four hours after the operation unless there is another patient or a relative in the room with her.

9. When the patient is returned to her bed from the operating room, have at least one pillow to elevate the head; or, if the nature of the operation will allow, place her in a sitting position with the bed rest. Do not remove the pillows or place a towel over the head of the bed or over the pillows, and if you must have a pus basin near in case of vomiting, put it out of sight of the patient, for it will be hours before she vomits, if at all.

10. The same nurse should administer all the injections to each patient and only two doses (the first and the second) should be given in the patient's room. The third dose should always be given in the operating room and

should be ordered by the anæsthetist after she has seen the patient.

11. Catheterize the patient after she is in the operating room. The secretion of urine is often so rapid that the bladder will contain at the time of operation from two to eight ounces of urine, if the patient is catheterized in her room just before being carried to the operating room.

There are many minor details which the anæsthetist may learn by close observation. Paralysis of the jaw or tongue does not occur in one per cent of cases—so rarely that the necessity for removing false teeth is not often found. In fact, I strongly advise leaving in the upper set. In case both upper and lower are false, remove the under and leave the upper. Patients practically never vomit on the table, even though chloroform and ether are given to deepen the anæsthesia. I have known of only one patient who defæcated on the table, and that was due to an unfinished preparation.

The length of the anæsthesia extending over four to ten hours makes it important to place the arms and legs in a perfectly comfortable and well supported position. I have had a number of patients who had a temporary paralysis of one or both arms after the anæsthetic, one at Provident Hospital, one at Passavant Hospital, one in Hackley Hospital (Muskegon, Michigan), one in St. Joseph Hospital

(Joliet, Illinois), and two at Mary Thompson Hospital. In each case there was no adjuvant used to complete the anæsthesia and the effect of the anæsthesia was especially prolonged.

The mouth and air passages are always dry and the patient can be made more comfortable by having at hand a swab of cotton moistened with sterile water to wet the mouth and lips. No mucus will ever be found rattling in the throat or trachea. The reflexes are weakened or abolished, so that the degree of anæsthesia cannot be judged by them.

The pupil will be dilated or contracted, depending on the greater susceptibility of the patient to the scopolamine or to the morphine.

The guide to giving more or less of ether or chloroform is the amount of resistance shown by the patient.

If the patient offers resistance during the operation, and the manipulation is to be continued, more of the adjuvant is indicated; and it is right here that the success of the anæsthetic leaves the realm of the mathematical problem and becomes an art.

The operator and the anæsthetist should understand the areas of great sensitiveness and those that have little or no sensation.

The steps of the operation should be known to the

anæsthetist as well as to the operator, so that when sensitive areas cannot be rendered insensible by local anæsthesia the scopolamine-morphine anæsthesia can be deepened with chloroform or ether. In order to prevent an anæsthetist who is not accustomed to this anæsthetic from giving too much chloroform I instruct them to give it in this manner:

"Drop slowly five drops of chloroform on the mask; stop dropping, count five slowly; drop five drops again on the mask; stop dropping and count five slowly; continue until I say, 'Stop!' Do not remove the mask." When I see that I am going to need a little deeper anæsthesia again, I say: "Now drop five drops, count five"; and this is continued until I say again, "Stop!" In this way I have had most satisfactory results with a very untrained person dropping the chloroform. And although it puts a greater responsibility on the operator, it does not compare with the annoyance and anxiety of having a patient who is asleep with morphine-scopolamine given as much chloroform or ether and given by the same method that would have been followed had no morphine-scopolamine been administered.

For a painful dressing, dilatation of rectum, cystoscopy or some slight surgical procedure, one dose of 1/50 grain scopolamine and ¼ grain morphine will be found to be quite sufficient and most satisfactory. The patient will be

under its influence in three-quarters of an hour and will remain under the anæsthetic for at least three hours after the administration of the dose.

Chloroform and even ether act so quickly when the patient is under morphine-scopolamine that it is never necessary to begin its administration more than one or two minutes before needed. I usually do not begin chloroform anæsthesia until after I have the knife in my hand, and occasionally not until after the skin incision has been made.

Some patients need only two doses of scopolamine-morphine and others may have the third dose of the scopolamine or of the morphine reduced or omitted.

When the respirations are below 8 the third dose is omitted if the patient is well asleep, if not, give 1/100 gr. of scopolamine and no morphine; if the patient is very excitable after the second dose give 1/8 gr. of morphine at the third dose and no scopolamine. After 60 years of age the dosage should be cut down to one-half or one-fourth and the same rule applies to cases in which we have heart, lung or kidney disease.

CHAPTER IV

Administration for Obstetrical Anaesthesia

HE administration of morphine-scopolamine for surgical anæsthesia and the administration of scopolamine-morphine for obstetrical anæsthesia offers a marked difference. For surgical anæsthesia we give as large a dose of morphine as possible and only enough scopolamine to overcome its disagreeable effects, increase its power to relieve pain and induce sleep. But for obstetrical anæsthesia we give as much scopolamine as possible and only enough morphine to overcome the excitement that would result from giving scopolamine alone.

In surgical anæsthesia we desire a greater or less degree of relaxation and absolute quiet, and to secure this the patient must be unconscious and too deeply asleep to be aroused by manipulations or sensations of pain. In an obstetrical anæsthesia we desire unconscious sleep between pains and such a degree of anæsthesia during pains that the patient will not make muscular efforts during the first stage or inhibit efforts during the second stage. The anæsthesiæ are so different, as well as the dosage, that I would like to give to the surgical anæsthesia the name morphine-scopolamine anæsthesia and to the obstetrical anæsthesia the name scopolamine-morphine anæsthesia. The obstet-

rical anæsthesia is produced and maintained in the following way:

As soon as the patient is known to be in labor she is given the initial dose—1/100 grain of scopolamine and ⅛ grain of morphine—after which she is prepared locally, examined and given a colonic flush. This will consume from twenty to thirty minutes, and by this time the patient will be drowsy and glad to go to bed. She is then conducted to the delivery room and put to bed in a sectional delivery bed (Plate I). If the pains are strong and frequent, 1/100 grain of scopolamine is repeated every half-hour for two or three doses, but if the pains are feeble and infrequent, 1/100 grain of scopolamine is repeated every hour for two or three doses. The initial dose and two following at one-half or one hour intervals usually suffices to put the patient under the anæsthetic.

The degree of anæsthesia may be tested in the following way: between pains one should not be able to arouse the patient by addressing her; in many cases, no matter how loudly you speak her name, she does not respond; during pains she should not be able to make co-ordinate movements, even though capable of making violent inco-ordinate movements. These tests we have named the Calling test and the Inco-ordination test.

The condition called the Calling test—or the inability

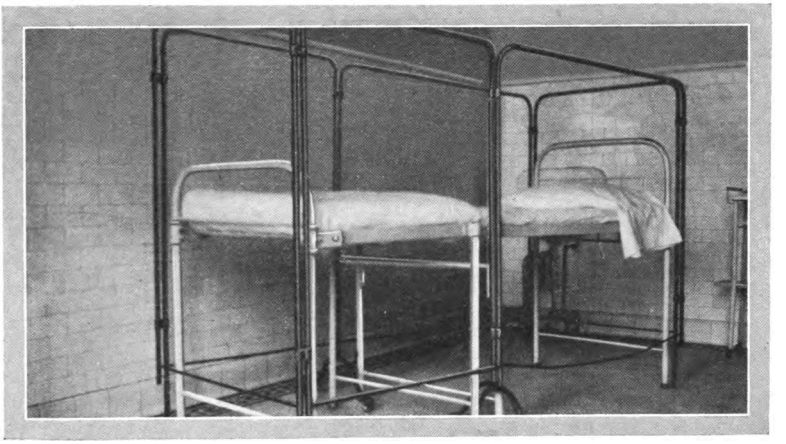

PLATE III. BED WITH SCREEN ADJUSTED.

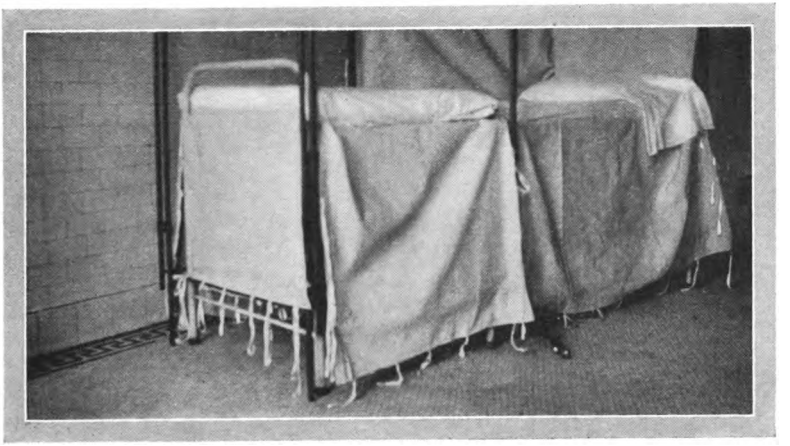

PLATE IV. BED WITH CANVAS PARTIALLY ADJUSTED.

to answer to a call—is many times obtained earlier than the Inco-ordination test. If both are present, your patient is under the anæsthetic and will not need another dose for two hours. If only one test is present and that the calling test, and the labor is advancing rapidly as indicated by frequent and severe pains, you will be wise if you give the fourth dose at the one-half hour or hour interval.

After the anæsthesia has been produced (and that will be after the third or fourth injection), the vulva may be prepared by the use of an antiseptic solution, a large sterile pad applied and the obstetric envelope (see Plates X, XI, XII) put on the patient. Also a gown, the chief features of which are a continuous sleeve (see Plates XIII, XIV) and a Rubin shirt fastener. Incidentally, this continuous sleeve provides a convenient test for inco-ordination by simply throwing it over the patient's head; if co-ordination is lost, the patient will not be able to raise her head and slip the sleeve over it.

At this time specially constructed screens (Plate III) are placed completely surrounding the delivery bed. A canvas cover (Plate IV) with overhanging sides has been placed under the mattress and the sides are now lifted and securely tied to the tops of the screens. By so doing, the bed is converted into a canvas crib (Plate V) with sides two and one-half feet high.

As the pains increase in frequency and strength, the patient tosses or throws herself about, but without injury to herself, and may be left without fear that she will roll onto the floor or be found wandering aimlessly in the corridors. In rare cases, where the patient is very excitable and insists on getting out of bed, 1/32 grain of morphine may be given and repeated in one-half hour if necessary; but I prefer to fasten a canvas cover over the tops of the screens, thereby shutting out light, noise and possibility of leaving the bed. From now on until the head is ready to deliver the patient needs not be touched except to be given every two hours 1/100 grain of scopolamine to maintain the anæsthesia.

CHAPTER V

Typical and Atypical Cases

YPICAL cases of morphine-scopolamine—i. e., surgical anæsthesia—feel drowsy about twenty minutes after the first dose and always fall asleep before the end of an hour. The sleep deepens after the second injection and the patient will not rouse or notice the third injection. The face begins to flush after the second dose and the mouth and throat become dry. The pupils are slightly dilated and the patellar reflexes diminished. After the third dose the face is deeply injected, almost swollen, in appearance, the mouth and throat dry and the patient at intervals sucks the tongue. Pupils are dilated, the patellar and pupillary reflexes absent and Babinski marked in the right foot. Up to this time the patient makes no attempt to speak, but will answer questions very intelligently until half an hour after the second dose.

When the patient is placed on the cart to be taken to the operating room she will make no effort to help herself unless it be to lift up the head or to grasp the cart tightly with her hands, apparently in great fear of falling.

After being placed on the operating table she may open her eyes and look about or attempt to lie on her side or to draw her knees up, but in two or three minutes she is again in a deep sleep.

The skin is often sensitive, but after the skin and peritoneum are incised the appendix may be removed or a gastroenterostomy may be performed without starting a reflex.

The patient is sensitive to light and noise until after the third dose, but for two hours after the third dose light and noise do not disturb the patient. This is the period of deepest sleep. Two hours after the third dose the sleep begins to be lighter and four hours after the third dose the patient is nearly conscious. The flush begins to leave the face two hours after the third dose, but the mouth remains dry for eighteen hours after the third dose. The pulse has been slightly accelerated and force increased after the second dose, but after the third dose the pulse gradually drops until as the anæsthetic wears off it is a few beats lower than before the anæsthetic was begun. The respirations remain practically unchanged. Four hours after the third dose the patient will be able to converse intelligently, but will have no memory of it on the following day.

During the operation the patient will make an occasional remark—saying that she is suffering pain or making some incoherent reference to her personal affairs.

Sight is often disturbed for one or two days. The patient sleeps the greater part of the time for sixteen hours after the third dose. When the patient wakens it is

as from a refreshing sleep, with no sensation of pain, nausea or disturbing dreams, and remembers nothing after the second dose was given. If too much water is drunk, it may be suddenly rejected ten or twelve hours after the operation; but the vomiting will not be attended with nausea. The patient will sleep poorly the first night following the operation, but will have little or no pain.

In a typical case of scopolamine-morphine—that is, obstetrical anæsthesia—the patient will fall asleep in twenty or thirty minutes after the initial dose, and the sleep will gradually deepen, so that between pains the patient cannot be wakened, but will roll over or toss about in the bed during the pains. As the pains increase in strength, however, the patient seems more restless and more awake. As the first stage nears the end, the patient usually sits in a squatting position in the bed and between pains sleeps with the head resting against the canvas sides of the crib.

At the beginning of the second stage inco-ordinate efforts are made by the patient to go to the bathroom, and constant references are made regarding that necessity—none of which need be heeded unless examination of the abdomen indicates a full bladder, in which case she may be catheterized.

As soon as the expulsive stage arrives, the patient lies

down again and from this time on the perineum should be watched at intervals for bulging.

When the head is seen at the vulvar orifice the canvas sides are let down, the sectional bed disjointed and the upper section shoved to a convenient position in the room (Plate VII). The Bierhalter stirrups are put in place, the obstetric envelope removed, the continuous sleeve slipped over the patient's head, the legs secured in the stirrups and a broad band of webbing applied to the thighs in the form of a double spica and the ends fastened to the iron rod at the end of the bed (Plate VIII). The placing of sterile sheets completes the preparation for delivery (Plate IX).

No haste need be made and no ether or chloroform given, for the delivery of the head will be quite as slow as the most careful obstetrician could desire. If the patient is put into the stirrups too early the smoothness of the delivery is greatly interfered with; and it is equally important to convert the bed into a crib as soon as the patient is under the scopolamine-morphine anæsthesia.

The head requires no holding back, and need not be delivered between pains to preserve the perineum. The patient is never instructed to bear down or not to bear down and—except while the head is being delivered—should not be coerced in any way.

The restraint given by the canvas sides of the bed and the continuous sleeve, though slight, will be resented by the patient.

If you desire to waken the patient between pains, strongly flex the head on the chest for a few seconds and by relieving the anæmia of the brain you will have a fairly ready response (Plate XV).

In the obstetrical anæsthesia where we give a larger amount proportionately of the scopolamine we often notice an increasing sensitiveness with every dose injected. The patient may not notice the first prick of the hypodermic needle, but each succeeding prick seems to be more annoying to the patient; but after the delivery, when the patient wakes up, she has no memory of any injection after the first one or two.

Even in surgical anæsthesia, when after the third dose sensitiveness to light and sound has disappeared, the sensitiveness to touch will still be strong. The one memory common to the majority of patients is of being taken in an elevator. Only a few have any memory of the operating room, and describe it as seeing "lights."

Atypical cases may be produced by giving morphine-scopolamine in a hospital where it is not usually given and where nurses and internes are not acquainted with the anæsthesia. I performed an appendectomy on a young

man 25 years old in a small two-story hospital with no elevator and the operating room in the basement. I ordered the patient to be brought to the operating room fifteen minutes after the third dose. When the time came for his arrival I was greatly annoyed and surprised to see the patient walk into the operating room and climb onto the table with very little assistance. He had walked the length of a long hall and down two flights of stairs to the operating room. After lying on the operating table ten minutes he was so soundly asleep that the appendix, which was ruptured, was removed without the patient taking any other anæsthetic except the three doses of morphine-scopolamine.

A similar, though annoying, experience occurred in one of our best managed hospitals, where I had operated many times under morphine-scopolamine anæsthesia. In this case, after the patient had received her third dose, she was awakened and with some difficulty assisted into a wheel chair and taken to the anæsthetic room adjoining the operating room. Here she fainted away while being assisted out of the wheel chair. I ordered her taken back to her room and postponed the operation until the following day.

One patient, who had had an extensive resection of the saphenous veins on both legs for the relief of varicosities,

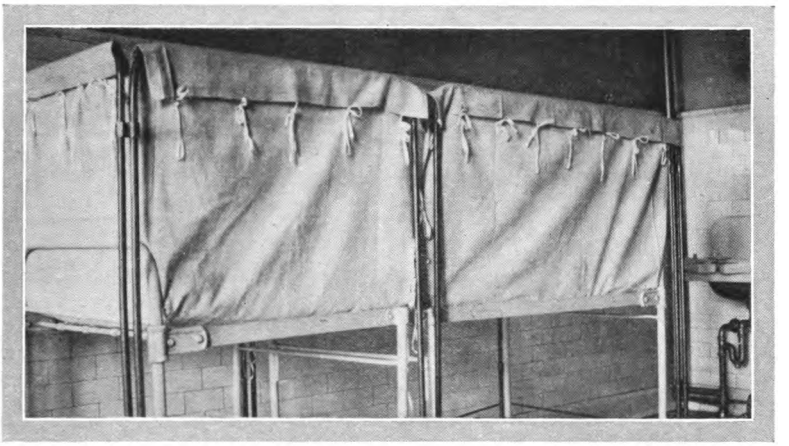

PLATE V. BED WITH CANVAS ADJUSTED FORMING A CRIB.

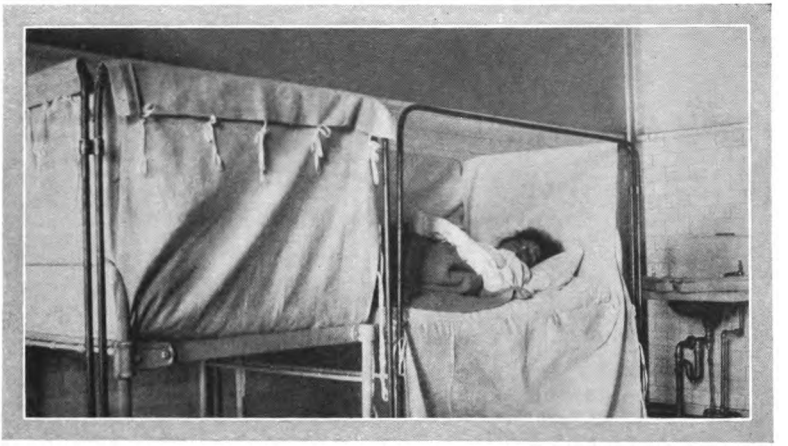

PLATE VI. PATIENT IN CRIB BED READY FOR EXAMINATION.

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slept quietly during the afternoon and evening following the operation, but about midnight was found wandering in the corridor. When asked what she was doing she replied that she was going to call her husband to breakfast. She was put back in bed, but had no remembrance of her escapade the next morning.

The fact that there is no cumulative effect in scopolamine-morphine is well illustrated by a patient who entered the hospital for inguinal hernia. He was given 1/100 scopolamine and ¼ morphine at 5:00, 6:00 and 7:00 a. m., and was ready for operation at 7:30 a. m. I happened to be in attendance on an obstetrical case that was making such progress that I was quite sure it would terminate by 7:00 a. m.—in time for me to operate at 8:00 or 8:30 o'clock. The case, however, hung on until 2:00 p. m., when I telephoned the hospital that if the patient was not asleep to repeat the same dose given in the morning and that I would operate at 4:30. The nurse misunderstood the message, and although the patient was not yet conscious, the scopolamine-morphine was repeated so that the patient had 1½ grains of morphine and 6/100 grains of scopolamine in six doses over an interval of ten hours. The operation was performed at 4:30 p. m. and the patient awoke the next morning at 8:00 with no remembrance of anything that had happened on the previous

day. Convalescence was normal, save an erythema over the greater part of the body, which appeared on the eighth day and disappeared on the tenth.

The mental condition of the patient is a very poor guide to the amount of amnesia or analgesia present.

In one of my early cases the patient, a foreign-born woman, was brought to the operating room apparently wide awake. Instructions were given not to begin the ether anæsthetic until ordered. The field of operation was prepared and curettage performed, without any complaint from the patient. The patient looked around the room, and at the conclusion of the curettage asked for a glass of water and drank it. The operation was continued with a trachelorrhaphy and anterior colporrhaphy, at the conclusion of which the patient drank another glass of water. The final step in the operation was a perineorrhaphy, after which the patient drank a third glass of water. She was taken to her room after the operation, and those who had observed the anæsthetic attributed her being awake, speaking and drinking and yet making no movement of the body, to the fact that she was foreign born and could bear pain better than our American women. She spoke with her husband in her room after the operation and after he left she went to sleep. She awakened in the evening, when her husband returned, and

asked when her operation was going to be done. It was with great difficulty that she was convinced that the operation had been done ten hours previously.

When scopolamine is given without morphine, or in great disproportion, one is likely to have a very trying experience. Twice it occurred that through a misunderstanding of the attending physician the patient was given three doses of scopolamine, each 1/150 grain, with no morphine. The patient slept quietly when not moved or touched, but the slightest touch roused her and she became a perfectly uncontrollable maniac. It was not possible to take her on a cart to the operating room without first giving her chloroform. The patient required very little chloroform and save for the annoyance the anæsthesia was satisfactory.

To those who are unaccustomed to morphine-scopolamine anæsthesia the occasional lowering of the respirations causes much anxiety. One of the remarkable facts is that these patients are not the patients who are most likely to be cyanotic. I have watched for an hour a patient whose respirations were two in three minutes. At no time were the respirations shallow or was there any cyanosis or weakening of the pulse.

Another source of anxiety is the occasional increase of pulse rate after the second dose—I have noted an increase

of fifty beats—but the force and fullness of the pulse allayed any anxiety, and after the third dose the pulse dropped to normal or a moderately increased pulse rate.

Cyanosis appears more frequently in thin, poorly nourished patients than in any other. In the early experience with this anæsthesia we saw more than we see now, and it is probably due to the fact that now we never give a third dose except in the operating room, and a patient who would become cyanosed gets a smaller dose of morphine in the third dose, i. e., 1/100 grain of scopolamine and 1/8 grain instead of 1/4 grain of morphine, and the cyanosis is prevented.

Tubercular patients have occasionally given trouble, so much so that we advise especial attention to be paid to the dosage of such patients.

One patient, age 28, tubercular, constantly coughing, had the uterus emptied of a three and one-half months' pregnancy; operation lasted 40 minutes. She had only two doses of scopolamine 1/100 grain and morphine 1/6 grain. She lost considerable blood during the operation, respirations were shallow and pulse weak. Stimulants were given and she left the operating room in good condition, as regards pulse and respiration. The patient was wheeled into an adjoining room to be taken later to her own room. In ten minutes after leaving the operating room the patient was

pulseless and no respiration; by stretching the anal muscle, gasping respirations were established; when efforts ceased, the patient ceased breathing. Artificial respiration was not very successful, but was resorted to. Both legs were bandaged from toe to the body and a tank of oyxgen was administered, also heart stimulants; color of the patient returned and the respirations became more regular, and fifteen minutes after the pulseless condition the patient spoke regarding her children. She made an uneventful recovery, leaving the hospital in as good condition as when she came.

Another patient, 40 years old, a Hebrew, markedly tubercular, was deeply cyanosed and respirations ceased on her return to her bed after the operation. Administration of oxygen put the patient in good condition in two minutes and she became conscious immediately.

CHAPTER VI

Report of 5,000 Morphine-Scopolamine Anaesthesiae

OPERATION FOR	NO.
Cholecystotomy	38
Cholecystectomy	23
Exploratory Cœliotomy	35
Amputation of Cervix	461
Trachelorrhaphy	57
Colporrhaphy	283
Perineorrhaphy	650
Modified Longyear	3
Pelvic Abscess	41
Removal Cervical Polyp	88
Excision of Vaginal Cyst	9
Curettage—	
Endometritis	332
Menorrhagia	148
Dysmenorrhea	512
Incomplete Abortion	278
Carcinoma of Cervix	93
Diagnosis	267
Incision of Abscess	158
Excision of Lipoma	21
Excision of Fistula	51
Ingrowing Toenail	67

Infected Hand	14
Removal of Foreign Bodies—	
Bladder	5
Uterus	2
Buttock	1
Hand	6
Foot	8
Papilloma of Bladder	3
Urethral Caruncle	40
Valvovaginal Abscess	48
Valvovaginal Cyst	26
Laceration of Urethra	3
Freeing of Clitoris	46
Hemorrhoidectomy	98
Dilatation of Sphincter Ani	27
Ischio-rectal Abscess	13
Rectovaginal Fistula	7
Breast Operations—	
Radical	31
Amputation	3
Removal Tumor	16
Excision of Cervical Glands	8
Hallux Valgus	19
Removal Coccyx	32
Trephining	4

SCOPOLAMINE-MORPHINE ANAESTHESIA

Thyroidectomy—	
Exophthalmic	10
Hypertrophy	22
Watkins Wertheim	78
Varicose Veins	15
Jejunostomy	1
Gastrectomy	4
Drainage Pancreatic Cyst	1
Drainage Common Duct	12
Cystoscopy	127
LeFort	6
Removal of Hymen	28
Gastrotomy	3
Gastroenterostomy	12
Resection of Small Intestine	12
Resection of Large Intestine	6
Hysterectomy—	
Abdominal	220
Vaginal	265
Oophorectomy	298
Ovariotomy	187
Resection of Ovary	157
Salpingectomy	516
Oophorectomy and Salpingectomy	191
Broad Ligament Cyst	10

Ventral Fixation of Uterus	146
Round Ligament Shortening	438
Hernia—	
Umbilical	26
Inguinal	46
Femoral	18
Ventral	28
Linea Semilunaris	1
Appendectomy	770
Myomectomy	217
Nephrectomy	8

Total, 7,954 operations on 5,000 patients.

This list of operations gives an idea of the character of the operations so that anyone can readily understand the general applicability of this anæsthetic to almost every field of surgery.

In the list are no tonsillectomies, no Cesarean sections, no operations on children, for the reason that we have always considered age under twelve years, throat operations and obstetric operations a contra-indication to morphine-scopolamine anæsthesia. Throat operations require an anæsthetic of short duration, and one from which the patient may recover quickly enough to keep the blood out of her trachea and œsophagus. The other contra-indications

are based solely on the fact that children cannot be given morphine except in very small doses, too small to give us any general anæsthesia effect.

The deaths occurring in this group of patients numbered twenty-seven—that is, less than three-fifths of one per cent mortality. Some of these deaths do not properly belong to this record. For example, No. 4308 died two months after the operation, of chronic nephritis—which was advanced when she entered the hospital for an emergency appendectomy. No. 4252, dying three weeks after operation, had advanced pulmonary tuberculosis when the abdomen was opened for tubercular peritonitis. No. 2768 was an exophthalmic goitre, whose death we had expected many times during the three months preceding the operation. No. 4820 was brought to the hospital with general septic peritonitis, streptococcus infection; drainage instituted. No. 932 had an ulcer of the stomach that had perforated more than twenty-four hours before I saw her.

In such cases not only the anæsthetic, but the operation, is not responsible. It is notable that we lost no patient as the result of curettage; and this includes many patients who were in a bad general condition at the time the anæsthetic was administered. One had five per cent sugar in the urine; many were depleted by hemorrhages, and others were septic. No patient having a breast operation

died, although one was 84 years old, and the breast, besides the carcinoma, contained many ounces of pus. She was brought to the hospital on a stretcher, moribund, not expecting an operation, and in two weeks was walking.

No gastroenterostomy or gastrectomy died, and one was a feeble man 75 years old with carcinoma of the stomach. He is still alive, seven months after the operation.

No patient died after trephining. A broad ligament tumor operation is one of the most difficult operations if the tumor is large. We had ten, all large, and one weighed fifteen pounds; yet no mortality. Perhaps one of the best tests for the anæsthetic was 438 round ligament operations without a death.

Taking up the mortalities in detail—

We have No. 2768 and No. 4812 exophthalmic goitre. No. 2768 was kept on medical treatment for a number of months before entering the hospital, but with no improvement. She was in no condition to have an operation, but was herself very anxious for an operation. She was kept in bed in the hospital for four weeks and finally, at the earnest solicitation of the patient and relatives, the operation was undertaken. The pulse was 130 and respirations were 32 before operation, while during the operation and under the morphine-scopolamine anæsthesia the pulse was 120 and respiration 28. When I left the hospital four

hours after the operation she was in as good condition as she had been at any time before, but shortly after I left the heart became irregular and weak and she died about six hours after the operation, without regaining consciousness.

No. 4812 was a young girl with a large goitre surrounding and making pressure on the trachea. The right lobe was removed without any difficulty, but when the middle lobe was lifted, or any traction made, the patient had a spasmodic breathing with accompanying cyanosis. The operation was stopped three times to allow the patient to breathe normally again, but the fourth time the patient stopped breathing and it was impossible to resuscitate her; she died on the operating table.

Four cases died who had operations for gall bladder disease. No. 782, 51 years of age, had carcinoma of the gall bladder and ducts; the stones were removed, but it was impossible to secure any bile from the occluded ducts. The patient was intensely jaundiced and she died of exhaustion on the ninth day after the operation.

No. 820 was a nun 54 years of age, with stones and infection of the gall bladder of long duration. She was very feeble and with lowered resistance. I believe more extensive drainage should have been used. She died on the fourth day from toxæmia, with acute dilatation of the stomach.

No. 769 had been in bed for several weeks, was much wasted and very feeble. When the abdomen was opened carcinoma of the stomach was found with occlusion of the bile ducts. The gall bladder was drained, but the patient stood the operation poorly and died on the third day, never having completely recovered from the shock of the operation.

No. 4981 was operated upon for gall bladder disease. She was deeply jaundiced and had been so for weeks. The gall bladder was removed and the common duct explored and drained. The patient died of toxæmia on the fourth day.

Three deaths were the result of hysterectomy.

No. 438 was vaginal hysterectomy for acute infection following a criminal abortion. The patient came to the hospital with peritonitis and pus tubes. An effort was made to drain through the posterior cul de sac. The patient not improving, the uterus was removed in the hope of establishing free drainage and removing pus foci. The patient died of septicæmia on the seventh day.

No. 3980 was an operation for complete prolapse. The patient stood the operation well, but died quickly as the result of a secondary hemorrhage on the third day.

No. 4060, aged 45, was a supra vaginal operation for large fibroids; the patient was depleted by frequent hemor-

rhages before entering the hospital; stood the operation well. I saw her in the morning and considered her in good condition; one hour after leaving the hospital I was telephoned that she had no pulse and was dying. No post-mortem was held and the death certificate stated thrombus as cause of death.

No. 2060 was an advanced carcinoma of the uterus; the patient had been having hemorrhages and had lost a great deal of blood during the operation, owing to an involvement of the bladder. She died of shock and loss of blood twelve hours following the operation.

No. 2998 had a hysterectomy and cholecystectomy. The patient died on the eighth day with streptococcus infection; infection not known to be present before the operation.

No. 3675 and No. 4791 were uncomplicated perineorrhaphies. Both died of streptococcus infection and were not known to be infected before the operation. No. 3675 died on the twelfth day; No. 4791 on the thirty-ninth day.

No. 932, 65 years old, had an exploratory operation in the night at her private home in the country. I found the abdominal cavity filled with stomach contents from perforated ulcer of the stomach. The patient died of peritonitis on the second day.

No. 3645. The patient had a very large ruptured ovarian cyst and myxomatous peritonitis. Extensive adhe-

sions were found everywhere and kept up constant oozing. The patient died at the end of twenty-four hours from exhaustion and shock.

No. 3110 and No. 3313 had had a salpingectomy for pus tubes. Both died on the fourth day with septic peritonitis.

No. 3910 died on the twenty-first day following a jejunostomy. The patient had a malignant papilloma of the stomach, inoperable, and the jejunostomy was merely palliative.

No. 4252 had an extensive and advanced tubercular peritonitis. Tubercular tubes and ovaries were removed, but the patient had pulmonary tuberculosis and died on the twenty-first day, exhausted by the general tubercular infection.

No. 2987 had an operation for a large ventral hernia. She had asthma, with a history of attacks resembling angina. She was profoundly affected by the anæsthetic, in contrast to a patient who had a similar operation the hour before and who was scarcely asleep, although the same dose was prescribed. Some time after the patient's death —which occurred twelve hours following the operation— it was discovered that the patient who died had had four doses of scopolamine and that the patient operated on the hour before had had only two doses. This mistake arose

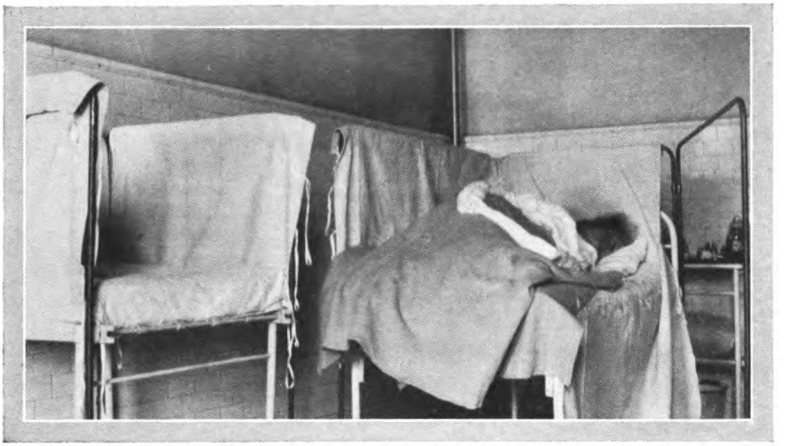


PLATE VII. BED DISJOINTED AND PREPARATION FOR DELIVERY BEGUN.

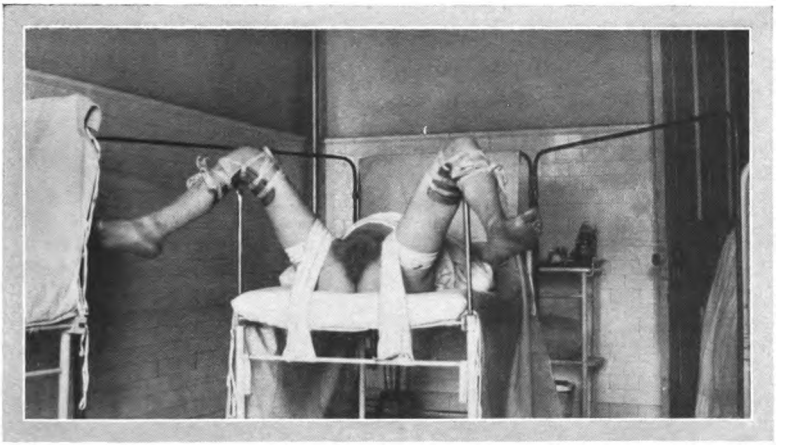


PLATE VIII. PREPARATIONS FOR DELIVERY COMPLETE EXCEPT STERILE COVERS.

on account of the patients lying in adjoining beds and having foreign names almost identical. A change of nurses had been made after the first doses had been given and before the last doses were due, and the first patient had received four doses in two hours' time and the second patient two doses with an interval of one and one-half hours between.

No. 4611 and No. 4308 died of general peritonitis due to ruptured appendix.

No. 4820 had an exploratory incision with drainage introduced for general peritonitis with streptococcus infection.

No. 3612, 45 years old, alcohol and opium habitue, was convalescent from operation for chronic appendicitis and retroversion. She was to have gone home on the following day. As the nurse was bringing in the tray for her supper, the patient gasped, "Oh, my heart!" and when the internes reached her room there was no sign of life. No post-mortem was held, and the death certificate gave thrombus as the cause.

No. 2114, 49 years old, had a strangulated umbilical hernia and died suddenly on the fifth day from a thrombus.

No. 3841 had a papilloma of the bladder. The growth was removed through a supra-pubic incision; hemorrhage was profuse at the time of the operation and continued

after the operation. The patient died in twenty-four hours as a result of loss of blood.

No. 4980 had septicemia due to infection from the pelvis of the kidney. She was in very poor general condition at the time of operation—which consisted in putting drainage in the kidney and making an exploratory abdominal operation. The patient died of sepsis on the fifth day.

These deaths date back to 1904, and it can very easily be seen that no death could be attributed to the morphine-scopolamine anæsthesia. The death rate from all causes is between one-half and three-fifths of one per cent, and surely with routine cases unselected one could hardly expect a lower mortality with any anæsthetic. The mortality, I believe, is low because of the use of scopolamine-morphine anæsthesia—especially in those cases where the patient is in poor general condition with nephritis or diabetis or where the patients are suffering from irritability of the nervous system, as in asthma or from hyperthryoidism in goitre.

It is of interest that six per cent of these patients showed albumen granular casts or sugar in the examination of urine made before operations, while only one per cent showed albumen granular casts or sugar after operations. Patients with asthma breathe quietly under the anæsthetic and may even be placed in the Trendelenburg position during operation.

Effect of Morphine-Scopolamine Anaesthesia on the Respiration

Table I

Change in Respiration	Doses 3 each 1/150 gr. scopolamine 1/6 gr. morphine	Doses 3 each 1/100 gr. scopolamine 1/4 gr. morphine
Below 14	26%	23%
Between 14 and 10	15%	17%
10 and below 10	11%	6%
8 and 9	4%	2%
7	1%	1%
5 and 6	1%	1/5%
4	1%	2/5%

To compute this table the respirations were taken from the charts before any scopolamine injections were given and again after the patient returned from the operating room.

It is interesting to note that the change in respiration is much the same whether we use the large or the small dose, the reason being that the proportion between the doses is the same—that is, 1/100 : ¼ :: 1/150 : 1/6.

If it is important that the respiration should not be changed or lowered, this may be easily effected by giving

a much larger dose of scopolamine, as 1/50 grain scopolamine with ¼ grain morphine or decreasing the amount of morphine, as 1/100 grain of scopolamine with ⅛ grain of morphine. Seventy-five per cent of the patients suffer little or no change in the respirations.

If the patient is excitable or accustomed to taking alcoholics or opiates the respirations may be slightly accelerated.

I observed one patient where the respirations dropped to two in three minutes. The patient's color was good and the pulse strong and apparently unaffected. Nothing was done for or given to the patient to quicken the respiration, and she made an uneventful recovery.

The lowering of the respirations takes place about an hour after the second dose and respirations may continue low in these cases for hours after the operation. Any irritation of the respiratory passages is unusual. I know of no case having pneumonia and only two having a bronchial inflammation.

Eleven patients subject to asthma have been given the anæsthetic and when under it had no difficulty in breathing.

Effect on the Circulation

Table II

Pulse	After Second Dose		After Operation	
	Morph. 1/4 gr. Scop. 1/100 gr.	Morph. 1/6 gr. Scop. 1/150 gr.	Morph. 1/4 gr. Scop. 1/100 gr.	Morph. 1/6 gr. Scop. 1/150 gr.
From normal to above 100	.....	.....	7%	19%
Raised 40–50	3 %	.....	.....	.....
Raised 30–40	5 %	4%	.....	.....
Raised 20–30	10 %	7%	.....	.....
Raised 10–20	16½%	34%	24%	13%
Raised 2–10	26 %	23%	17%	24%
Unchanged	12½%	4%	11%	16%
Lowered 2–10	21 %	22%	41%	28%
Lowered 10–20	5½%	6%	.....	.....

We here note after the second dose an increase in the frequency of the pulse, while after the operation the frequency is decreased or unchanged in over fifty per cent for the large doses and nearly fifty per cent for the smaller doses. This increase after the second dose is probably due to the fact that the scopolamine is eliminated too quickly for its influence to be felt after the operation.

The little change in pulse rate after operation goes to show the anoci properties of the anæsthetic. Only seven per cent had pulse markedly raised after operation where the larger dosage was used, while nineteen per cent had pulse raised where the smaller dosage was used.

Changes in the pulse or respiration due to the drugs take place at different periods, and those periods are determined by the elimination of the scopolamine and the morphine. Scopolamine is eliminated so quickly that the effect of a dose is not felt two or three hours after taken, while the morphine is eliminated slowly; I have seen the effects of the morphine continue for 24 to 36 hours after the dose, though the usual period is 8 to 12 hours.

In cases where the patient has been put under the morphine-scopolamine anæsthesia and the operation has been deferred for a period of two or three hours, it is important not to repeat the same dose of scopolamine and morphine to continue the anæsthesia, because by so doing the patient will get an overdose of morphine, the morphine of the previous doses not being eliminated.

One case, No. 4990, was given 1/100 grain of scopolamine and ¼ grain of morphine at each of two doses one hour apart. A curettage was done under the influence of this anæsthetic and after the curettage it was decided to do a hysterectomy. The scopolamine 1/100 grain and mor-

phine ¼ grain was then repeated two and one-half hours after the last dose had been given. The patient slept profoundly from this time (10:00 a. m.) to 5:00 p. m., when she became cyanotic and her respirations slow and shallow. Oxygen and stimulants were given and the patient was conscious at 7:00 p. m., having been under the influence of the anæsthetic eleven hours—the longest time of any patient in the series.

But to demonstrate the anoci properties of this anæsthetic it is not necessary to use a table of pulse rates, for anyone who has watched patients waken from a scopolamine-morphine sleep and noted the happy expression of the face and the absence of pain and worry and marked the regularity and fullness of the pulse is convinced that the patient has been saved to a greater or less degree the shock of the operation.

The blood pressure changes are fairly constant and marked.

Seventy per cent had the blood pressure raised from 10 to 70 points, sixteen per cent were raised above 20, while four per cent were raised above 30. The greatest raise noted in any patient was 70, the greatest reduction was 44.

Ten per cent showed no change in blood pressure.

Twenty per cent were lowered, but it was in those patients, with few exceptions, whose blood pressure was 130 or above.

Seventeen per cent of the patients had blood pressure above 130; all these were reduced by the anæsthetic except two per cent. Four per cent had blood pressure below 100 and all of these were raised by the anæsthetic.

Thirty-four per cent had blood pressure between 100 and 120 and all raised except two per cent.

These observations were made on the patients, first, before any anæsthetic was given; second, after the last dose of anæsthetic, and before the operation, and third, after the operation.

It was found that the blood pressure was reduced in the majority of patients after the operation. Sixty-three per cent were lowered and twenty-seven per cent continued raised. Three-fourths of the cases where the blood pressure continued raised were abdominal operations, and I conclude that in the majority of cases the lowering of the blood pressure is due to the elimination of the scopolamine, which is partly effected at the end of the operation, and not due to the operation itself.

Effect on the Digestive System

The vomiting after scopolamine-morphine anæsthesia is rather different from the vomiting following chloroform or ether. It never begins until eight or ten hours after the anæsthesia is begun, and often is delayed

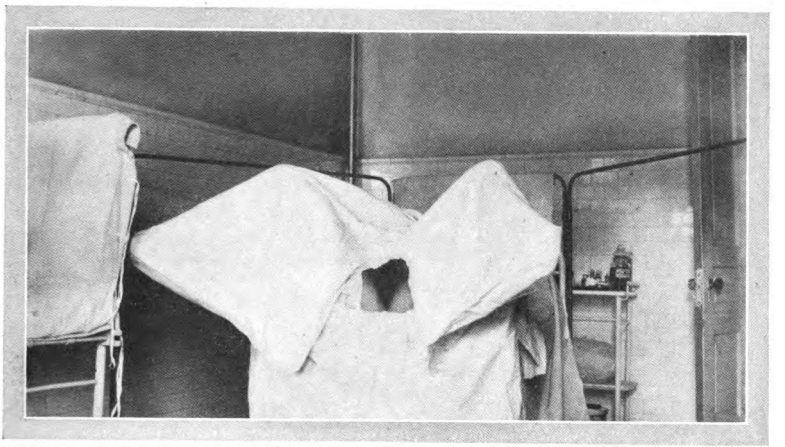


PLATE IX. STERILE COVERS AND GYN. SHEET APPLIED.

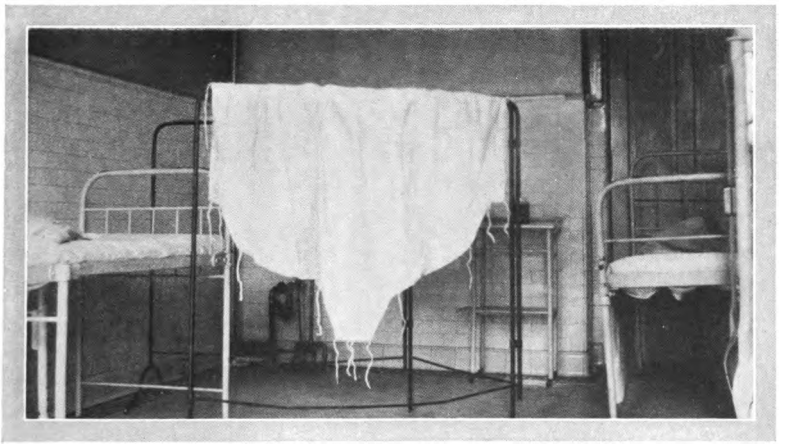


PLATE X. OBSTETRIC ENVELOPE OPENED.

for eighteen or twenty-four hours. In the majority of cases the vomiting is not accompanied by much nausea and, like seasickness, the patient feels entirely free from discomfort as soon as the stomach is emptied. In the majority of patients there need be very little restriction as to water. Where there was no chloroform or ether given, sixty-one per cent of the patients did not vomit at all, and of the thirty-nine per cent that vomited, thirty-three per cent were appendectomies and thirty-five per cent curettages. Appendectomies are more likely to vomit than any other cases. Out of 114 appendectomies uncomplicated by any other operative procedure, fifty-one per cent vomited.

Hysterectomies with appendectomies vomit in fifty-six per cent of the cases.

Curettages vomit on account of poor preparation.

Taking all cases under all dosages and with all adjuvants fifty-five per cent had no vomiting, thirteen per cent very slight. Thirty-two per cent had more than slight. Of this thirty-two per cent that vomited, forty per cent were appendectomies, twenty per cent hysterectomies, twenty per cent curettages.

Washing the stomach brings quicker relief than any other procedure, because where the vomiting is due to the anæsthetic it is chiefly the mucosa of the stomach, where

the morphine is being eliminated, that needs to be aided. Enemata given early also help to eliminate the morphine from the bowel, which, as well as the stomach, helps in ridding the system of the morphine. While the scopolamine is present in the system we practically never get vomiting; only seven patients in five thousand made any attempt to vomit on the table and only four actually vomited.

I believe that if 1/100 grain of scopolamine without morphine were given to the patient at the first sign of nausea or vomiting the vomiting might be checked at once. I have not used this method in a sufficient number of cases to make any report upon it.

Three per cent of the patients had the bowels move on the fifth day. These were perineorrhaphies, ruptured appendices, and vaginal hysterectomies, where a late bowel movement was desirable. Two out of five patients had bowel movement on the first and second day after the operation. Three out of five patients passed urine normally within twelve hours after operation.

Four patients had an ileus and were operated for that condition, no fatalities resulting. Each patient had had an appendectomy and one had had besides the appendectomy a large broad ligament cyst removed. Two were in men and two in women. The patients had been the sub-

jects of previous attacks of peritonitis and many adhesions were found in the abdomen and not broken up lest the infection present at the time of operation should be spread.

Effect on the Nervous System

Only one patient was mentally affected after taking the anæsthetic. No. 881 had a large ovarian cyst. She was 36 years of age and had been under Christian Science treatment for a period of ten years. The tumor weighed 52 pounds and had displaced all of the viscera, including the heart, whose apex beat could be felt and seen two inches above the nipple. No chloroform or ether was used as adjuvant and the patient made a rapid recovery for the first week, when she began to have delusions, imagining that hearses were passing her window and that dead people were being carried about the hospital. She ate well, the wound was healed, but she slept little at night and was removed to her home at the end of two weeks. Here she lost her delusions of funerals and began to talk baby talk to every one she met. Her husband took her away from home and they spent a month camping by one of the Wisconsin lakes, and she returned mentally normal and has remained so for the past seven years.

The success of the anæsthetic depends so largely on the

patient's mental and nervous condition that we have operated on many patients without their knowledge.

No. 870 had a chronic appendicitis and autointoxication from chronic constipation. She had received all the treatment usually given to neurasthenics and was at the time that I first saw her very poorly nourished and vomiting most of her meals. When an operation was proposed she refused and became hysterical. Her mother desired her to have the operation and said that she wished it could be done without the girl's knowledge. To her surprise, I said I could do so if she really wished it. I accordingly ordered two hypos of sterile water at 6:00 and 7:00 a. m. for two days; on the third day I ordered the hypos to be scopolamine and morphine instead of water. After the second dose she was asleep and did not know when the third dose was given. The appendectomy was done and the patient returned to her bed and propped into a sitting position with many pillows. She was told in the afternoon that I had ordered the abdominal bandage, which I had applied the day before, to be kept very tight and not interfered with. She did not know until the sutures were removed that she had had an operation.

This was my first experience of this kind, but I have used this idea with great success during the past two years in my goitre operations.

SCOPOLAMINE-MORPHINE ANAESTHESIA

No exophthalmic goitre operation done by the following method has resulted fatally: The patient is admitted to the hospital and prepared for the operation. On the following day, no matter what condition she is in, no breakfast is given, and the patient is taken to the operating room on a cart, placed on the operating table and given enough ether to render perfectly unconscious.

The neck is covered with sterile gauze, strips of adhesive plaster are fastened over the neck extending from the ears above to the nipples below. Over this is placed a heavy gauze roller bandage, making the neck almost immovable. The patient is placed in her bed without a pillow and a pus basin in sight on the edge of the bed. She is not allowed any water until evening and then only by the teaspoonful. She is kept without a pillow for three days and nights and all visitors are restricted. The relatives and patient believe the operation to be done. The patient sleeps well and the pulse becomes more normal daily. On the fourth, seventh or ninth day after the fake operation, as determined by the pulse rate, the patient is told it is time for her to sit up in a day or two, and in her hearing an order is given for a hypo in the morning and directions about removing the bandages and fixing the neck.

Three hypos are given in the morning—at 6:00, 7:00 and 8:00—and the patient is taken to the operating room

after the third dose (an exception to the rule that we give all third doses in the operating room). The operation is performed, if possible, without chloroform or ether being given and the patient is placed on a bed rest as high as possible when she is returned to her bed. Convalescence is rapid and uneventful. We have had no patient who has suspected that her operation was not performed the day after she entered the hospital.

One of the patients who was to have a perineorrhaphy and repair of the urethra decided that she would not have an operation and refused to lie down or go to sleep after the hypos. When I saw her she was ready to fight if any one touched her, and said, "I will not have an operation!" No attempt was made to force her, but later in the day her husband and daughter arrived and were keenly disappointed that the operation was not over. They begged me to do it without her knowledge.

On the morning of the next day I went to her room and told her I was going to give her a treatment such as she had had at the office. I inserted the speculum, disinfected an area near and gave her a hypodermic injection of scopolamine and morphine. At the end of an hour I returned to remove the packing I had left in the vagina and gave her another hypodermic injection of the anæsthetic. The third dose was given by the nurse and the

patient was taken to the operating room and the operation performed. It was not until the sutures were removed that she realized she had had an operation; but she still does not know that she was removed from her room to have the operation performed.

No. 3643 came to be relieved of a large lipoma just above the knee on the extensor side of the leg. The tumor was about the size of a soup bowl and was becoming painful. The patient was a Christian Scientist and it was more in a spirit of fun than of scientific interest that I decided to emphasize the miraculous properties of the anæsthetic. She was given as the first dose what was for her a large one—1/100 grain scopolamine and ¼ grain morphine. In ten minutes she was asleep and did not feel the second hypodermic injection. She was taken to the operating room and the incision after the tumor was removed was closed with a subcutaneous catgut suture and bandages applied. She was returned to her room unconscious and placed in a sitting position in bed, recovering consciousness in four hours after the operation. General diet was ordered and the only change in her life suggesting sickness was that she was kept in bed four days. She went home on the fifth day, but was told not to touch the bandages, and two weeks from the day of operation the leg was unbandaged and it was difficult to see the delicate scar line where the incision

had been made. The patient, in amazement, exclaimed: "I do not understand this. When was I operated on?"

"This," I replied, "is a miracle of modern medicine before which Christian Science should prostrate itself."

Five of the patients undergoing operations were epileptics and three were insane. The epileptics did well under the anæsthesia and two of the insane patients recovered their mental health after the operations had been performed.

The analgesic effect of the anæsthesia extends over a longer period than the unconscious or amnesic state. Sixty-five per cent of the patients under all conditions required nothing for pain. Twenty per cent had one or two doses of morphine, fifteen per cent had one dose of codeine. The patients requiring an opiate were largely made up of perineorrhaphies. The patients having anoci with the morphine-scopolamine anæsthesia are much less liable to pain and vomiting than where the anoci is not used.

There are many regions where the anoci produced by the morphine-scopolamine anæsthesia is sufficient and other regions where local injections of novocain ¼ of one per cent must be used to protect the patient from pain.

I have found through operative experience without local injections of novocain that the six most sensitive areas or structures are as follow:

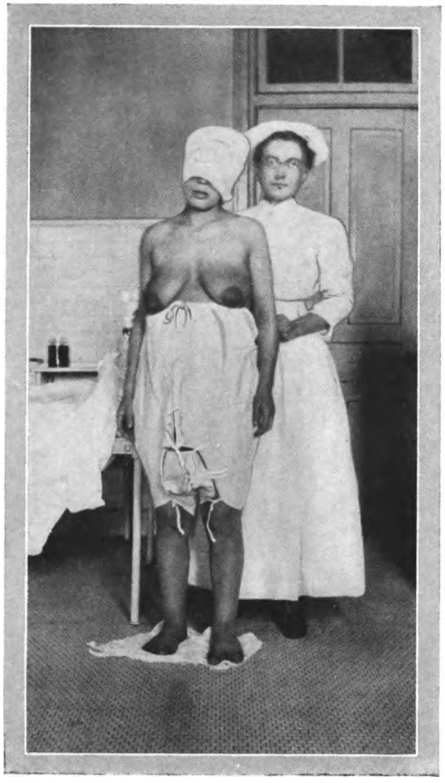


PLATE XI.
OBSTETRIC ENVELOPE. (*Front View.*)

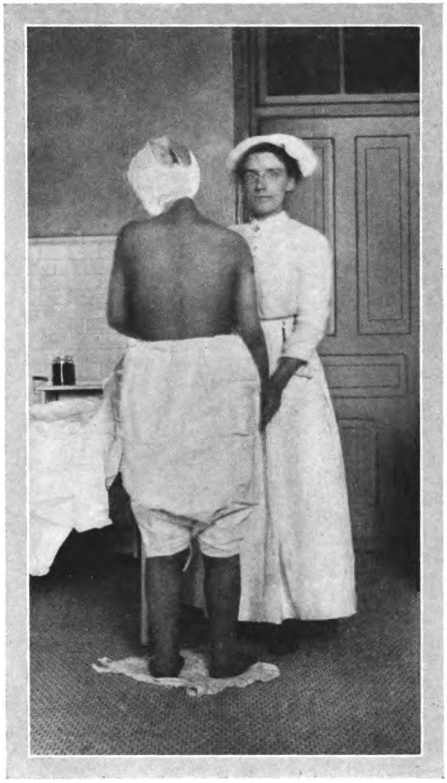
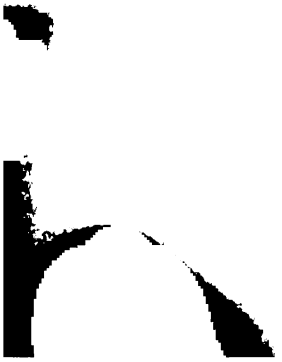


PLATE XII.
OBSTETRIC ENVELOPE. (*Back View.*)



1. Parietal peritoneum.
2. Skin.
3. Perineal region.
4. Sphincter ani.
5. Broad ligament when traction is applied.
6. Internal os of cervix.

The six least sensitive areas:

1. Mammary region.
2. Cervix uteri and vagina.
3. Neck.
4. Gall bladder and stomach.
5. Appendix and intestine.
6. Uterus and appendages if no traction is applied.

The obese patients are most satisfactory patients. They are almost sure to be able to undergo any operation with morphine-scopolamine anæsthesia alone.

I know of no very obese patient who has required chloroform or ether as adjuvant. This fact shows the folly of trying to regulate the size of the dose of morphine-scopolamine by the body weight.

No. 4801 was a patient weighing more than two hundred pounds. She had three doses of morphine-scopolamine, and with that alone was so well anæsthetized that I did a panhysterectomy with many adhesions, an appendectomy, a cholecystotomy and removal of stone from the

common duct. She made a rapid recovery, not being troubled with vomiting or gas pains.

No. 3218 had a large goitre and asthma so severe that every breath was labored. She had to have a radical breast operation for carcinoma. Three injections, each ¼ grain morphine and 1/100 grain scopolamine, was sufficient anæsthetic for the operation, which was nearly two hours in length. During this time the patient breathed quietly, showed no cyanosis and did not waken for six hours after the operation.

No. 3991 had an umbilical hernia and very pendulous abdomen. With only the scopolamine-morphine anæsthesia she had the hernia repaired and fifteen pounds of adipose tissue removed from the abdomen.

It has been suggested that it is a poor anæsthetic for carcinoma patients, but the records of these 5,000 patients show that 160 patients had malignant diseases and that of this number four died: one died immediately after the operation from loss of blood before and during the operation; the other three were inoperable cases and the operations were for diagnosis and alleviation.

Some of the patients have had a very rapid convalescence. No. 4995 had an operation for hemorrhoids performed at 5:00 p. m.; a plug of gauze was left in the rectum and instructions were given to remove it at the end

of twenty-four hours. The patient slept until 6:00 o'clock the next morning and awoke with the gauze plug in her hand. She was feeling so well that she arose, took a bath in the tub and dressed. She was up and about the hospital all day and left the hospital on the following day. I saw her two weeks after the operation and she was well and said she had never had any pain since the operation.

No. 4826 and No. 4732 were women physicians who had hysterectomies for large multiple fibroids; both were stout and a large incision was required. No. 4826 had had before operation a large internal hemorrhage due to rupture of one of the superficial veins of the fibroid. The abdomen was filled with blood when opened. Both patients resumed their practice, the one on the thirteenth day and the other on the fourteenth day, and have continued well since.

Amounts of adjuvant used have been calculated from the records and found to be as follows:

Where ether was used the average amount per hour was 3½ ounces in clinic and 2 ounces in private operations.

The largest amount per hour was 6 ounces in clinic and 15 ounces in private operation.

The smallest amount used per hour was 2/3 ounce in clinic and ½ ounce in private operation.

Where chloroform was used the average amount per hour was 2/3 ounce in clinic and ½ ounce in private operation.

The largest amount used was 2 ounces in one hour in clinic and the same in private operation.

The smallest amount used was 1 dram in clinic and 1/3 ounce in private operation.

The average duration of the anæsthetic was four and one-half hours after the last dose was given. The longest time before a patient became conscious was eleven hours, the shortest time one hour. Forty-seven per cent of the patients were unconscious more than four hours after the last dose was given. Twenty-three per cent were unconscious less than four hours, thirty per cent were unconscious four hours.

CHAPTER VII

One Hundred Consecutive Cases of Twilight Sleep at the Mary Thompson Hospital, June 1 to December 1, 1914

BEGAN using scopolamine in obstetrics about eight years ago, but gave it up after a short experience. This early experience demonstrated to my satisfaction that scopolamine-morphine shortened the first stage of labor. I gave at that time 1/100 grain of scopolamine and ¼ grain of morphine as the initial dose and expected to repeat it in four hours unless the cervix was completely dilated. The injection was never given until the pains were strong and regular, and my experience was that at the end of two or three hours after the injection the cervix was completely dilated. I feared at this time to repeat the dose, so the labor was completed by using a little chloroform for the delivery of the head.

This large dose of morphine was occasionally given so close to the beginning of the second stage that I feared that the infants would be asphyxiated on account of it. In no case could I have stated positively that it had caused asphyxia, but on theoretical grounds alone I gave up its use altogether in obstetrics. Then, too, my obstetrical work was largely made up of Cesarean sections, forcep deliveries, eclampsias and abnormalities, cases where the

life of the child is always in jeopardy, and I feared that scopolamine-morphine used in such cases would be unjustly blamed for any accident that might occur.

In 1909 I met Professor Gauss at the Sixteenth International Congress of Medicine, Budapest, and he urged me to try scopolamine in my obstetrical cases and gave an enthusiastic report of his work.

But the overwhelming prejudice in the profession against this anæsthetic made me hesitate to enlarge the field of its usefulness. When the article on "Twilight Sleep" appeared in the June, 1914, number of "McClure's," I hailed it as the means of dispelling some of the prejudice and immediately requested the staff of the Mary Thompson Hospital to allow me to give scopolamine-morphine a trial in the ordinary routine cases of the obstetric service. Having had ten years' continuous use of this anæsthetic in surgery, and an obstetrical experience extending over twenty-five years, I felt I might venture to formulate rules and dosage for its use in obstetrical practice without endangering the life of mother or baby.

The dosage and the general management as worked out is fully described in Chapter IV. Table I demonstrates our results. No cases are selected and the only contra-indications that have been considered are lack of time or the necessity for immediate operative procedure.

TABLE I

Primipara	58	
Multipara	42	
Lacerations in Primipara	29	
Lacerations in Multipara	7	
Hemorrhage Severe	1	12
Hemorrhage Free	2	
Hemorrhage Slight	9	
Forceps High	2	13
Forceps Medium	3	
Forceps Low	8	
Asphyxia	11	
Resuscitation Difficult	5	
Resuscitation Easy	6	
Twins	2	26*
Breech	5	
Placenta Previa	1	
Premature	4	
Eclampsia	2	
Posterior Positions	22	

*Abnormalities.

From this table it is seen that the lacerations in primipara were fifty per cent and in multipara sixteen per cent. One patient had a severe hemorrhage which was the result of a deep tear through a congenital transverse stricture in

the vagina. Eighty per cent of the patients lost so little blood that it was not possible to estimate it. The uteri contracted immediately after delivery and showed little tendency to relax.

Fourteen per cent were abnormal cases, not including 22 posterior positions, all of which rotated anterior except two.

Three of the five breech infants and two with eclamptic mothers had to be resuscitated.

Seven of the 22 posterior positions necessitated forceps delivery and three of these infants were asphyxiated.

Two premature infants and one with short cord which was around the neck required resuscitation.

The high forceps were used with one case of eclampsia and with one case of contracted pelvis.

Medium forceps were used with one case of eclampsia, one case of contracted pelvis with a history of four previous labors with forceps, and one case of uterine inertia due to extreme diastasis of the recti muscles.

Low forceps used in six posterior positions and two primipara with delay at the perineum.

There were no infants lost at birth and all the mothers left the hospital at the usual time in good condition.

Two of the mothers had deficiency in the secretion of milk. Both were primipara, one 36 years old and the

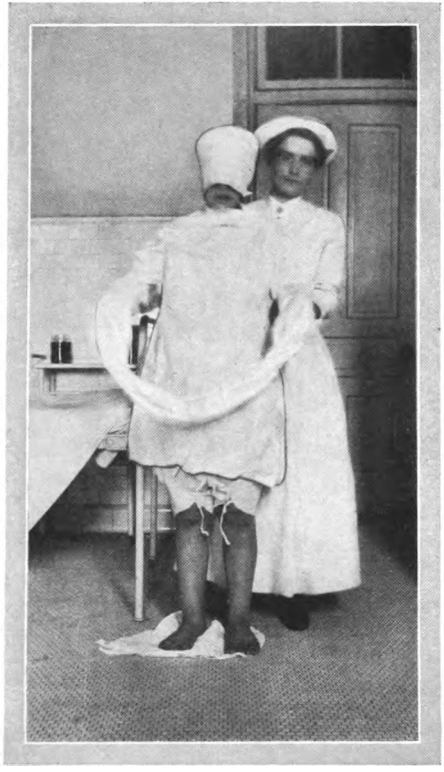


PLATE XIII.
GOWN WITH CONTINUOUS SLEEVE.

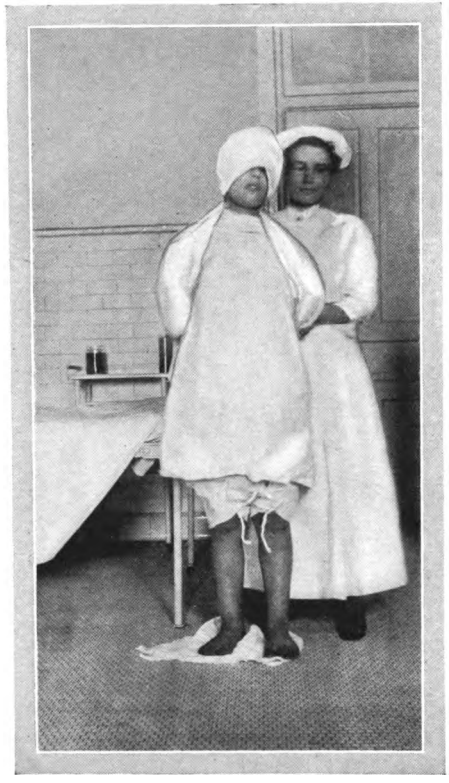


PLATE XIV.
GOWN WITH CONTINUOUS SLEEVE BEHIND NECK.

other 26. The latter had been deserted by her husband after the birth of the baby and the deficiency in milk was attributed to the patient's grief and her loss of interest in eating.

One of the patients, primipara, entered the hospital with general œdema and urine showing large per cent of albumen. She gave birth to twins, one weighing nearly seven pounds and the other nearly eight pounds. She was able to nurse both infants and they have gained at the rate of half a pound a week, requiring no artificial feeding.

Another patient, 44 years of age, para IV with history of being unable to nurse any of her three children born when she was between 28 and 32, was pleased and surprised to have an abundant supply of milk for her "Twilight baby."

Many of the patients would have shortened the period of their convalescence if they had been allowed.

A young Lithuanian mother gave birth to her first baby during the night. She had been in the hospital for several days waiting for her labor. The morning after her delivery she arose, and as on the previous morning, dressed herself and commenced to make her bed, when the nurse discovered her and sent her to bed.

On another occasion a patient who had been delivered at 10:00 o'clock p. m., at 5:00 a. m. was found leaving the

ward. She was seen by a companion patient and told that her baby had been born and she must go back to bed and ring for the nurse.

Four of the patients had normal labors for the first time, all of the previous ones being forceps delivery. One of them, a Greek woman, had a hard labor, but it terminated normally after five hours; and her husband expressed great enthusiasm for the management of the case, because in five other deliveries she had had "pinchers"—as he expressed it—used.

The patient under scopolamine-morphine seems to make very little muscular effort in the second stage, when compared with the patient without this anæsthetic, yet when a woman has had five previous labors with forceps delivery and then, under this anæsthetic, gives birth to a ten and a half pound boy without instrumental assistance, you begin to feel that much of the muscular effort exerted by the non-anæsthetized patient was not only unnecessary, but positively wasted energy.

It has been suggested that the chief effect of the scopolamine-morphine is to produce amnesia, and that the pain is not really decreased. We have in a few cases been able to demonstrate the value of the anæsthetic as an analgesic.

A young Russian Jewess entered the hospital screaming

with pain. She would not sit or lie down or even permit an examination. She was given 1/100 grain of scopolamine and ⅛ grain of morphine and twenty minutes afterward allowed the interne to examine her. The cervix was fully dilated and the head engaged. At the end of half an hour 1/100 grain of scopolamine was given, after which she was quiet between pains and complaining only slightly during pains. At the end of the next half-hour the third dose, 1/100 of scopolamine, was given—after which time she made no complaint, but bore down during pains and rested with half-closed eyes between pains. The baby was delivered one hour after the last dose, during a pain, as is our custom with this anæsthesia. There were no lacerations and the baby was lively. The patient was at no time unconscious, and expressed her gratitude at being relieved of the pain.

Many anæsthesiæ in multipara are considered unsuccessful, because the patient seems to live over the experiences of previous labors and refer those experiences to the present labor. This was accidentally discovered by carefully questioning the patients.

One said that she remembered everything, but most vividly the disagreeable tasting medicine given her after the baby was born. The facts were that she had had no

ergot or any other medicine while in the hospital except the injections of scopolamine-morphine.

Another patient said, with every possible intonation, whenever she had a pain, "A little more! A little more!" After the labor she thought she knew everything that happened and when asked what was most vivid, replied: "Dr. Shaffer's telling me to bear down a little more." On questioning Dr. Shaffer, who delivered her at a previous labor, and who was not able to be present at this labor, I found that the patient had at that time been urged again and again to bear down. No such suggestion was made at this delivery.

A trained nurse, who was very talkative during the delivery and had caused much amusement by ordering vegetables, picking out the poor ones, and getting the wrong change, gave a most striking example of the effect of preconceived ideas. She exclaimed in a frightened voice just after the head had been delivered: "A hemorrhage! A hemorrhage! Massage the uterus!" When conscious the next day she was asked what she remembered. She said she remembered when the membranes ruptured and of course when she had that terrible hemorrhage. As a matter of fact, the membranes did not rupture, but came down over the head as it was delivered; and she lost scarcely a drop of blood. She had, however,

as a nurse been with a number of patients who had had severe hemorrhages and she feared such an experience for herself. This was the explanation of the memory.

So many of the patients come into the hospital in labor that it is difficult to calculate the length of the first stage, and I feel that even the length of the second stage is more or less imperfectly known, as many patients are examined only once and a few enter after the second stage has begun.

I shall therefore not attempt to give statistics, but state my opinion—which is that the length of labor is materially shortened. This comes from the shortening of the first stage, for, although the second stage is lengthened, it is not lengthened by more than one or two hours, while the first stage is shortened by from two to ten hours.

No effort is made to draw off the milk or to keep the baby from the breast after the delivery under scopolamine-morphine anæsthesia and no ill effects have been noted by so doing.

The noisy or excitable patients make a profound impression on the nurses and physicians and have a tendency to dampen the enthusiasm for the anæsthetic. Only eight per cent, however, of the patients were noisy, excitable or difficult to manage—and would have been probably quite as difficult if they had had no scopolamine-morphine.

Additional doses of morphine were given sixteen patients. Three received ⅛ grain, five received 1/16 grain and eight received 1/32 grain.

The additional doses of morphine are not necessary when one can have the proper apparatus for managing the case.

TABLE II

TABLE OF DOSAGE

Successful cases of amnesia and analgesia.....70
Partially successful analgesia and amnesia.....26
Failures in both analgesia and amnesia..... 4
Largest dosage given—Morphine 2/8 gr. and 1/32 gr., scopolamine 9/100 gr.
Smallest dosage given—Morphine 1/16 gr., scopolamine 1/200 gr.
Cases given 1 dose..... 6
Cases given 2 or 3 doses.....41
Cases given 4 doses.....25
Cases given 5 doses.....14
Cases given 6 doses.....13
Cases given 9 doses..... 1

The Table of Dosage shows that seventy per cent had perfect analgesia and amnesia. Twenty-six per cent had either or both the analgesia or amnesia imperfect. The

four per cent failures were due to the patients receiving only one dose and being delivered before it could take effect.

Many of the cases reported as only partially successful are quite as, if not more satisfactory, than those that were entirely successful.

It is encouraging to see that forty-one per cent or nearly half of the cases did not require more than three doses, while sixty-six per cent did not have more than four doses. The largest dosage was morphine 2/8 and 1/32 grains and scopolamine 9/100 grain. This was given to a primipara with elongated conical cervix, position of baby R O P rotated to A, labor twenty-four hours' duration, no laceration, no forceps, no hemorrhage.

In September, 1909, at the Sixteenth International Congress at Budapest, I reported a series of operations performed on pregnant women under morphine-scopolamine anæsthesia. I have since added six cases to this number, and present them in Table III.

TABLE III

Case No.	Para.	Gestation	Diagnosis	Operation	Result	Labor	Child
1	2	3 mo.	Dermoid Cyst. 21 in. cirf. Torsion of pedicle.	Right Ovariotomy	Recovered	Normal, full term	Living male, 9 lbs.
2	3	5 mo.	Syphilis, Hemorrhoids and Fistula in Ano.	Excision of Hemorrhoids and Fistulous tract.	Recovered	Normal, full term	Living male, 8 lbs.
3	3	4 mo.	Retroverted and Incarcerated pregnant uterus.	Reposition by manipulation.	Recovered	Normal, full term	Living female.
4	2	5 mo.	Acute Appendicitis.....	Appendectomy....	Recovered	Normal, full term	Living female, 7½ lbs.
5	1	2 mo.	Acute Appendicitis.....	Appendectomy....	Recovered	Normal, full term	Living male, 8 lbs.
6	2	5 mo.	Appendiceal Colic, due to fecal concretion.	Appendectomy....	Recovered	Normal, full term	Living male.
7	2	5 mo.	Unilocular Ovarian Tumor, size of adult head, incarcerated in pelvis.	Right Ovariotomy	Recovered	Normal, full term	Living female.
8	5	3 mo.	Appendicitis and left pyosalpinx...	Appendectomy and Oophorosalpingectomy.	Recovered	Normal, full term	Living female.
9	1	2 mo.	Acute Appendicitis.....	Appendectomy....	Recovered	Normal, full term	Living.
10	8	2 mo.	Acute Appendicitis.....	Appendectomy....	Recovered	Normal, full term	Living female, 11½ lbs.
11	1	8 mo.	Double Gonorrhoeal abscess vulvo vaginal gland.	Incision and Drainage.	Recovered	Normal, full term	Living female, 6 lbs.
12	3	6 wks.	Diastasis of abdominal wall, retroversion of uterus, lacerated perineum.	Ventral herniotomy, temporary, suspenso uteri, perineorrhaphy.	Recovered	Normal, full term	Living male.
13	1	7 mo.	Syphilis, multiple abscesses in both axillae.	Incision and drainage.	Recovered	Normal, full term	Living male.
14	2	4 mo.	Retroverted and incarcerated uterus ovaries and appendix adherent in post cul-de-sac.	Adhesion released. Uterus replaced and Appendectomy.	Recovered	Normal, full term	Living male.
15	1	3 mo.	Appendicitis.....	Appendectomy....	Recovered	Normal, full term	Living female.
16	1	5 mo.	Appendicitis.....	Appendectomy....	Recovered	Normal, full term	Living male.
17	1	4 mo.	Appendicitis.....	Appendectomy....	Recovered	Normal, full term	Living twins.
18	2	4 mo.	Ruptured papillomatous ovarian cyst on left, large; ovarian cyst on right, small.	Double ovariotomy	Recovered	Normal, full term	Living male.
19	2	3 mo.	Elongated and hypertrophied cervix with threatened abortion.	Amputation of cervix.	Recovered	Abortion.....	Macerated foetus.
20	2	2 mo.	Appendicitis.....	Appendectomy....	Recovered	Produced abortion at 5th month.	Living male.

PLATE XV. VAN HOOSEN METHOD OF DEEPENING RESPIRATION OR AWAKENING PATIENT.

Although the number of cases here is small, the fact that they are not selected and that the operations were performed under different conditions in eight different hospitals makes it evident that much may be attributed to the morphine-scopolamine anæsthesia in preventing interruption of pregnancy, because it secures—first, the full physiological effects of two of the most powerful uterine sedatives for two hours before the time of, during the operation, and for twelve to seventy-two hours after the operation; second, lessened shock; third, comparative freedom from vomiting; fourth, relief from post-operative pain. This removes some of the predisposing causes of interrupted pregnancy. In support of the great value of the morphine in threatened abortion, J. M. Baldy reports that when he used morphine during or after the operation on pregnant women they did not abort in four cases; where he did not use any morphine, they aborted.

One might fear that the hypodermic injections of three-fourths grain of morphine and three-one-hundredths of scopolamine within two hours' time given to a pregnant woman would be injurious to the fœtus. That the injections are absorbed by the fœtus, the experiments of Holzbach prove conclusively. He found that the scopolamine was excreted in the urine in the colostrum and in milk for the first three days after it was injected; that in a quarter

of an hour after the injections were given the mother, the drug had passed through the placental circulation and appeared in the urine of the new-born child.

In the adult the most notable effect is on the blood pressure, which it increases in seventy per cent of the cases. We must look for a similar action in the fœtus, and although we have no direct means for taking the blood pressure in the fœtus, my observations on the fœtal heart have demonstrated to me that the sounds of the fœtal heart became more audible while the fœtus is under the scopolamine-morphine anæsthesia. We have, therefore, the stimulation of the circulation as the most prominent action of the anæsthetic on the fœtus, and the fœtus could probably survive doses of the scopolamine-morphine that would prove fatal to the mother.

I have reported these few cases hoping to help establish confidence in this anæsthesia for pregnant women undergoing surgical operations or examinations, and to emphasize these points:

1st. That amounts injected sufficient to produce surgical anæsthesia will not endanger the life or retard the development of the fœtus.

2nd. That this anæsthetic tends to prevent interruption of pregnancy.

3rd. That the increased strength of the fœtal heart

under this anæsthetic may aid us in making a differential diagnosis of pregnancy.

In abortion the effect of the anæsthesia is ideal, for it will either prevent abortion if there is any possibility of doing so, or if the abortion is inevitable it will not only relieve all pain, but will accomplish that much desired result, the expelling of the entire ovum as a whole from the uterus, so that curettage or any manipulations are unnecessary.

The administration of the anæsthetic is the same in abortion or premature labor as in labor at full term. These advantages may be expected in giving obstetrical patients "Twilight Sleep":

1. The relaxation of the soft parts (especially sphincters) and the absence of acute pain have a tendency to shorten the first stage of labor (probably by one-half), thus conserving the strength of the mother.

2. The relaxation of the soft parts and absence of acute pain make the second stage more manageable, especially the delivery of the head. Under "Twilight Sleep" most women practically deliver themselves without laceration.

3. The secretion of milk is better maintained because of the absence of shock during labor and fatigue following

labor. The "Twilight Sleep" furnishes an anoci for labor, with all its marvelous benefits.

4. Hemorrhage is a rare occurrence. In only three cases out of fifty was there enough blood to measure or estimate.

5. The period of convalescence may be shortened on account of the rapid involution of the uterus and normal condition of the mother; both direct results of anoci.

6. If necessary to do version or apply forceps, no chloroform or ether is necessary, and even repairs may be made without the patient's remembering it.

7. The effect of scopolamine is to drive all the blood into the capillaries, to increase the activity of the kidneys, stimulating elimination and relieving nervous irritability, thus aiding in the management of puerperal convulsions and toxemias.

8. In abnormal deliveries the child stands a better chance for life on account of increased action of the heart induced by the absorption of scopolamine. The effect on the heart was beautifully demonstrated recently in one case of breech delivery, where the child was asphyxiated, but the heart-beat was so strong that it raised and lowered the handle of the hemostat that was lying on the chest of the child.

To sum up: The lessening of hemorrhage, the decrease

in number of lacerations, the rapid convalescence, the increased secretion of milk, all make for infant welfare.

"Twilight Sleep" should be used for its advantage to the child: To give it a better chance for life at the time of delivery; a better chance to have breast-feeding; a better chance to have a strong, normal mother; a better chance to escape *in its after-life* the results from the use of high forceps and improper feeding.

Scopolamine-morphine, with its wonderful anoci properties, solves the problems of child-bearing and rearing for the highly organized mothers of modern civilization, for it virtually uncouples the brain from the spinal cord, and for the time being leaves the woman a good animal to bear her offspring as easily as any other animal. It is the greatest boon the Twentieth Century could give to women.

CHAPTER VIII

The Mental Effects of Twilight Sleep

PRELIMINARY REPORT, WITH SUGGESTED TECHNIQUE FOR RESEARCH

BY ELISABETH ROSS SHAW,
Author of "Mental Measurement"

HE thoroughly modern physician is accustomed to considering the mind and body of his patient as one indivisible whole, and constantly makes use of encouragement, persuasion and other sane and conservative forms of mental treatment.

To such a physician, a drug which not only inhibits mental phenomena, as all anæsthetics do, but which sometimes produces temporary mental reactions of considerable variety, ought not to seem wholly unnatural and uncanny. The fact that this drug produces its best effects when used in conjunction with persuasion and encouragement should not cause irritability in any physician accustomed to the wise and efficient handling of human nature.

In the following descriptions of actual events during scopolamine-morphine anæsthesia, the reader's attention will first be attracted to the striking contrasts shown in various cases. Only later, after thoughtful analysis, will resemblances become apparent. This variety of reaction

occurs even when the identity of external stimulus is controlled with laboratory precision; hence the inference seems justifiable that the variation of effect has its roots in individual human nature. Therefore, the problems involved belong in the realm of physiological psychology.

No tabulation of either contrasts or resemblances between individual patients will be attempted here, as it is doubtful if a tabulation covering less than a thousand cases would be scientifically valid. The observations are noted in chronological order without any effort to draw psychological conclusions. No claim is made that the cases here recorded are typical; they were selected at random, and happen to include some extreme illustrations of great muscular activity and complete passivity, of total amnesia and almost complete recollection of events.

The chief purpose of this brief preliminary report is to urge the adoption of a uniform and convenient psychological technique for the study of this complex problem, so that the labors of different investigators can be correlated, and conclusions eventually drawn from the combined experience of numerous experts. Research work demands not only infinite accuracy and patience, but the most impersonal attitude of mind, and final conclusions will be scientific in proportion as their authorship is as composite as that of a folk song.

SCOPOLAMINE-MORPHINE ANAESTHESIA

The technique here suggested is of composite authorship and of purely clinical origin. *It has been widely used for psychiatric, pedagogic, military and vocational purposes. Its chief advantage is its utter simplicity. Unfortunately, this simplicity does not extend to the interpretation of the results. A specially trained nurse or interne, with the help of a good stenographer, could do the actual mechanical labor of testing and recording; but only an expert should be trusted to analyze and interpret the phenomena of consciousness or subconsciousness revealed in the records. This fact should be most earnestly emphasized: this technique is simple and easy only for the patient and for the technical assistant, never for the interpreting psychologist on whom the real responsibility of the experiment rests. Unquestionably this interpreter should have taken the anæsthetic himself, preferably more than once, in order to have the introspective basis for interpreting the mental effects of the chief forms of dosage in common use. Otherwise he would be like a man born blind, discoursing learnedly of color sensations.

In order to avoid misunderstanding, it will be well for

*NOTE: For further information concerning these and other methods in use by Professor Robert Sommer in the Klinik fuer psychische und nervose Krankheiten in the University of Giessen, see the writer's booklet entitled "Mental Measurement."—A. C. McClurg & Co.

the reader to be prepared for a few of the glaring paradoxes which he will meet in the following pages:

1. The patient who showed the greatest degree of muscular activity during the period of anæsthesia remembered comparatively little afterward. (See Case A.)

2. The patient who was most talkative remembered nothing. (Case S, not reported here.)

3. A patient who was remarkably silent and docile remembered far more than any of the others. (Case F, not reported here.)

4. A patient who had the bravery to *claim* complete peace of mind, really had such a horror of the knife that the drug could not produce its full effect. The same patient at a second, far more serious, operation slept soundly without chloroform or ether, because she was then truly free from anxiety. (See Case C.)

5. In the introspective testimony of the writer, the degree of consciousness does not coincide with the clearness nor coherence of speech. (See Case X.)

Description of Case A—(Obstetric)

A Russian Jewess, aged 32, third confinement, exceptionally bright mentally, as shown by psychologic tests which lack of space forbids our reproducing here, came to

the hospital last June suffering from unhealed lacerations caused by the birth of her second child nine years previous, was discovered to be pregnant and operations on the lacerations deferred.

The course of this pregnancy had been under medical oversight and the child is believed to be one month overdue. The mother knows that a few days after delivery she must be operated upon. During the first Orientation test on November 23rd, she says: "Well, I am thinking of this (the lacerations) all the time 'cause I have to be 'tended to." Tells of the death of her eldest child and adds philosophically: "It seems like if anybody has to go, they go." Seems to be patiently resigned and free from anxiety with regard to the coming events. The birth had then been expected daily for two weeks, yet she showed no sign of suspense.

On December 7, 1914, at 1:30 p. m., the patient came to the hospital, having "slight backache." The membranes had broken that morning at 4 a. m.

The following doses were given:

4:45 p. m., scopolamine grs. 1/100, morphine grs. 1/8.

5:15, 5:45 and 6:15, scopolamine grs. 1/100.

The tests began at 6:30, fifteen minutes after the fourth dose of scopolamine. At that time she was having severe

pains almost continuously. Her mind seemed perfectly clear. She spoke excellent English and failed in nothing but naming the month, which might have been due to preoccupation at the moment, or to the onset of motor aphasia. At Q. 4 she showed what might have been slight paralogia, at Q. 17 she suddenly dropped into a foreign pronunciation of English and in the next sentence broke out in a Yiddish exclamation. This was the first foreign word she had used at all. At the end of this test she was sleepy, but trustful and good natured, in spite of the pain.

At 6:59, after only an eight-minute interval, this test was repeated. This was forty-four minutes after the fourth dose. So rapidly had the mental effect progressed that when asked: "How old are you?" she answered the age of her child. (Paralogia.) In Q. 4 she showed inability to remember the question more than a moment. At Q. 5 she does not reply, but wails, and throws her pillow back of the bed, being evidently unconscious of what she is doing. She answers Q. 6 rationally, but gives no reply to same, rubs hands together, then stands up on the bed with an exclamation of pain in Yiddish. She staggers as if drunk, shows great muscular inco-ordination. Her answer to Q. 8 seems to show some interruption of the time-sense between 4 and 6 o'clock. At this moment the

second stage of labor began with its characteristic sensations in the pelvis, so she asks to leave the room. This idea constitutes a powerful auto-suggestion, which completely rules her conduct during the following hour and a half of unconsciousness. She answers Q. 9 correctly in English, then exclaims in Yiddish. At Q. 10 seems to be the onset of auditory aphasia; she looks bewildered and asks: "What do you mean?" but answers correctly after the question has been repeated; Q. 11 brought no response, whether because of aphasia or genuine sleep could not be determined; Q. 12 was followed by a few irrelevant Yiddish words concerning her own sensations, and by a distinctly articulated English sentence showing hallucinations of paper on stove, after Q. 13 she talks Yiddish rapidly and mumblingly partly concerning the same idea of paper. From this moment she becomes violently active, thrashes around constantly trying to climb out of the crib. She does not seem emotionally excited, but good naturedly determined to act out the last idea that was in her mind before she lost consciousness. At 7:12 p. m. a blanket is laid over the top of the crib and strongly pinned on, but she breaks the fastenings, so it has to be held in place by several people. She moans softly, says: "Oh, Weh," many times, mutters in Yiddish unintelligibly, even to one

who understands the language. Much of this time she is quite silent, pushing upward perseveringly against the blanket. Speaks no English until 7:24, when she suddenly laughs aloud and says with perfect articulation, "It's hot in here."

The blanket is immediately taken off. After a short interval she stands up on the bed again and resists silently but determinedly while three physicians steady her and persuade her to lie down. Her eyes are open, but she shows no sign of consciousness. After this she lies down, and sleeps at frequent intervals, but only a minute at a time. The rest of the time she pushes strongly but silently at the blanket or at the arms of the physicians who hold her by the sleeves. Her face is wholly expressionless, and she makes no response to her name, no matter how loudly called.

At 8:16 the bed is moved under the light and the crib curtains removed. She speaks a few disjointed phrases in English and Yiddish. Once cried out: "Momie, Momie!"

At 8:33 mumbles, "That's what I thought."

At 8:50 the doctor calls her repeatedly, loudly. Her eyes are open, but she makes no sign of consciousness. She lies quietly with her feet in the stirrups, seems to use her muscles efficiently, without haste or any unnecessary waste of effort. Face expressionless as that of a somnambulist.

In fact, the appearance of the case, from 7:12 onward, had been characteristically somnambulistic. Her movements had not been at random, but obsessed by one definite purpose, wholly uninhibited by any other ideas.

At 9:20 she gave birth to a plump boy. Delivery normal, without hemorrhage or laceration.

At 10:40, having slept soundly meanwhile, we found her awake, bright-eyed and rosy. The following conversation occurs. Doctor V. H.: "Well, how do you feel about your confinement?" Patient: "Oh, ma'am, I wish it was over." Doctor V. H.: "Are you sure your baby hasn't come?" Patient: "Oh, no, it hasn't come." (Positive, smiling.) Doctor V. H.: "Feel down there and see." Patient: "Oh, yes; I can feel my baby there. I can feel it move. They are just joking me." Doctor V. H.: "Have you had any pain since 4:00 o'clock?" Patient: "I don't know, perhaps I slept a little. Sometimes I think I have had pain."

The following morning at 10:05, when asked if she could remember, she laughed and said: "I really can't remember. I started to get sick about 4:00 o'clock. That's all I can remember." Persistent questioning and urging brought out a few apparent memories as to persons present, but as she mentioned only those whom she had doubtless expected to be present, these were not wholly convincing,

especially as she made some mistakes. Among these, however, were two memories which were unquestionably real; she said: "I remember the way they laughed at me." E. R. S. : *"Did it hurt your feelings?"* P. : "Oh, no. Probably if I'd hear anybody that way I'd laugh. I don't know what I was saying." "What is your next memory?" P. : "I don't know whether I was dreaming, but I think I remember how I wanted to get out in the other room. May be I dreamed it. After I fell asleep I didn't know anything about it." *"What did you mean when you said 'Momie'?"* P. : (with great surprise) "Did I say that. My mudder's been dead twenty years. I was a little child then—" (Sighs, rubs palms together.)

Description of Case C—(Operative)

A cultured American lady, age 63, of fine intelligence and habitual optimism, determined to be brave, but secretly feeling a horror of the hospital.

This case affords a striking illustration of the influence of emotion on the mental effects of the anæsthetic, as two operations were performed when the patient was in totally different moods.

On January 2, 1915, occurred the first operation, which was little more than a mere examination lasting seven or eight minutes. This examination proved the diagnosis of uterine carcinoma.

The patient, having expected the removal of a tumor at this first operation, apparently stayed awake in spite of the drug. She spoke distinctly, using exclamations expressive of the most extreme pain. Notwithstanding this, a moment later she claimed to feel "lovely" and during the operation her pulse decreased from 120 to 100. This was followed by complete amnesia.

The second operation, on January 6, was a pan-hysterectomy. The cancer proved to be squamous-celled, and one ovary was enormously swollen and filled with pus. The operation lasted over two hours, during which time the patient slept deeply with a peaceful expression. At no time during the operation did the knife appear to produce any effect on her nervous system. The few slight moans and twitchings recorded occurred when gauze was pressed on the tissues to dry them, and when gauze packing was inserted or removed. The healthy color and perfectly natural expression of her face throughout the experience was like natural sleep. The record which follows includes every variation from absolute peace which occurred during the operation.

Needless to say, this was followed by complete forgetfulness. The patient is making an excellent recovery.

FIRST OPERATION, SATURDAY, JANUARY 2, 1915
(*In operating room*)

11:20 a. m. (Pulse 120.) First operation begins.

11:21 a. m. "Oh, dear me (mumbles). (Patient cringes with expectation of pain.) "Yes, he comes. Oh, dear me. Please let me go. I can't stand that." (Moans.) "Oh, oh, my Lord."

11:25 a. m. "Oh, my! that hurts so." (Curettage.) "Oh, people, I never imagined— Oh, dear."

11:30 a. m. Operation finished.

11:30 a. m. Doctor V. H.: "How do you feel?" Patient: "Lovely." Doctor V. H.: "Have you any pain?" Patient: "A little at times." Doctor V. H.: "Have you had any pain this morning?" Patient: "Just a little." (Pulse 100.)

11:32 a. m. Doctor V. H.: "Where are you now?" Patient: "In the kitchen." Doctor V. H.: "Where are you going?" Patient: "Well, I am afraid I'll mix the nurse up because I have such a horror of the hospital."

MEMORIES AFTER THE FIRST OPERATION

Tuesday, January 5, 1915, 2:55 p. m. (three days after first operation). Question: "What have people told

you?" Answer: "The only thing is the nurse said my daughter stood in the hall with tears rolling down her face when I was taken upstairs. I remember the nurse put a nightgown and stockings on me and gave me a hypo in my left arm and I remember she gave me another hypo in my right arm. Then one of the doctors came and asked me if I was asleep yet and I said, 'No, I'm not asleep.' Then they gave me another hypo in the right arm. I don't remember anything after that." Question: "Where were you when you woke up?" Answer: "Right here. I didn't know that I had been taken from this bed."

SECOND OPERATION, WEDNESDAY, JANUARY 6, 1915

(*In operating room*)

8:10 a. m. (Operation begins with loosening of the vagina.) (A few slight twitchings of mouth, but most of the time complete repose.)

9:00 o'clock. (Abdominal section begins.) Perfect facial repose, breath puffs the lips out slightly.

9:07 a. m. Right corner of mouth twitches, a few slight moans as gauze packing is inserted. Moans increase.

9:12 a. m. Slight attempt at articulation. Face natural, slightly flushed.

9:21 a. m. One twitch of mouth. Slight moan, as gauze packing is inserted for a moment.

9:25, 9:27, 9:35, same as 9:21. Moans always when gauze is pressed on tissues to wipe away blood.

9:45 a. m. Mouth slightly open, tongue moves, attempt at articulation, as the whole loosened tissue is lifted. "La, La m-m-m—"

9:47 a. m. (Utero sacral ligaments severed.) Immediately snores softly.

10:00 a. m. Moan.

10:04 a. m. Catches breath, tries to articulate.

10:07 a. m. Catches breath, tries to articulate.

10:08 a. m. "Oh, my!" Tries to articulate.

10:12 a. m. (Beginning salt solution transfusion.)

10:21 a. m. Packing removed. Moan. Sleeps peacefully while the incision is closed.

10:30 a. m. Operation finished.

MEMORIES AFTER THE SECOND OPERATION

Monday, January 11, 1915, 11:30 a. m. (Five days after second operation.)

E. R. S.: "What do you remember?" Patient: "Nothing at all. I have slept most of the time this week." E. R. S.: "Do you remember being taken upstairs?" Patient: "No, I can not remember being out of this room."

SCOPOLAMINE-MORPHINE ANAESTHESIA

Description of Case X

On January 8, 1915, Dr. Van Hoosen and her assistants put the writer of this chapter under scopolamine-morphine anæsthesia as a psychological experiment. The full dosage was given as if a major operation were to be performed, and then the writer was forced to talk almost constantly for several hours, a full stenographic record being kept as a basis for further study of the mental functioning thus expressed.

We were led to make this experiment as the only logical next step in our study of the mental effects of the drug, because of the bewildering variety of effects produced in the bona fide patients, and the insuperable difficulties in the way of interpreting these effects. It therefore appeared necessary, first, to reduce the problem to its lowest terms by eliminating some of the most variable factors, such as illness, pain and anxiety; and second, to furnish an introspective basis for interpretation.

In the following description the separate records of the attending physicians and psychologists have been combined with the stenographic record in chronological order. The preliminary Orientation test, taken in the train on the way to the hospital, was for the purpose of discovering the mental attitude of the examinee immediately before the

experience. It will be apparent that the mood was optimistic, and that the humor of the situation was keeenly appreciated.

TEST I

On the train going to the hospital.

Name—Shaw, E. R.

Week Day—Friday

Date—January 8, 1915. Hour—1:30 p. m.

(Seconds)

1. *What is your name?* (1.0) Elisabeth, Elspeth, Betsey and Bess (bantering tone).
2. *When is your birthday?* (.8) Independence Day (bantering tone).
3. *Where is your home?* (1.0) Evanston—my parish (bantering tone).
4. *What year is this?* (1.2) 1914—'taint neither! (bantering tone).
5. *What month is this?* (.7) January, 1915 (slightly triumphant tone).
6. *What day of the month is today?* (1.5) 8th. I looked it up on purpose (bantering tone).
7. *What day of the week is today?* (.4) Friday. I can just see that calendar!
8. *How long have you been here?* (1.5) Since the train started—I was mentally trying to figure—

9. *In what city are you now?* (1.4) Chicago (nods).
10. *Who brought you here?* (2.4) Dr. Van Hoosen.
11. *What kind of a house is this?* (1.6) (laughs) Movable house.
12. *Who are the people in this house?* (2.4) Friends and strangers—the former being more important.
13. *Who am I?* (1.5) Yourself—spelled with a capital Y.
14. *Where were you a week ago?* (4.2) (frowns) At the hospital. No, I was on this train going to the hospital.
15. *Where were you a month ago?* (2.4) In Evanston —that's pure guesswork.
16. *Where were you last Christmas?* (4.2) (frowns) At Uncle Al's.
17. *What did you get for Christmas presents?* (6.6) (tilts face, makes gestures signifying helplessness) I dunno. The only one I really liked was, I was going to say a Bridget apron, but I liked my Chinese gown, too—and a string of Venetian beads, but I got that by a process of reason—remembered the person that gave them to me.
18. *Are you sad?* (5.0) The top layer of me is feeling very humorous, the under layers get less comfortable as I go down.

19. *Are you sick?* (1.4) No.
20. *Why do I ask you all this?* (2.6) (grins) Pure diviltry.

2:40 p. m. REFLEXES January 8, 1915.

I. Pupils *Before Dosage*

Light	Size with electric light at arm's length	Same at 1 ft.	Accommodation	Crossed reflex
R. Normal	4	3½	Normal	Normal
L. Normal	4	3½	Normal	Normal

II. Patellar

R. Normal reflex.
L. Normal reflex.

III. Plantar

R. No response to stimuli.
L. No response to stimuli.

3:00 p. m. Temperature 98.4, Pulse 84, Respiration 20. (Says, "I am so comfortable.")

First Hypodermic

3:00 p. m. ¼ gr. morphine, 1/100 gr. scopolamine.
3:09 p. m. Beginning of

TEST II

This is a test of ability to memorize 15 pairs of words, some logically connected and some illogically, after the method devised by Professor Ranschburg. The following

list was substituted for the Ranschburg list, because the examinee was already familiar with the original.

school—pupil
son—daughter
sound—ear

Repeated all of these, and said, "My eyes are beginning to get very blurred, as if I had atropin in them."

land—water
horse—carriage
wheel—axle
cat—dog
rise—fall
hat—bonnet

Repeated these except wheel—axle. She says, "There ought to be another pair." She remembered these two also a moment later when asked by A. T., "What did I say after wheel?"

snake—fiddle
hand—mountain
door—box
apron—courtyard
paste—canal
milk—paper

Says, "I want to start with land—water, and I know that won't do. I want to start with fish—thunder and I know that won't do."

(Note: The words fish—thunder belong to the original Ranschburg test.) (Then after a pause of ten seconds, repeats all the words except hand—mountain.) Says, "That's all I can remember. My mouth is getting very dry and my eyes feel so funny."

A. T.: *"What did I say after hand?"*

E. R. S.: (after 3.2 seconds) Mountain!

"What did I say after paste?"

(After 2.4 seconds) Canal. Oh, that's one I forgot. Canal—I almost said "map."

(Test interrupted for 10 or 15 minutes by taking of reflexes.) Says, "Oh, I am dizzy, and things look so funny." (Rubs hands across mouth.)

3:29 p. m.

REFLEXES

I. Pupils

	Light	Size with electric light at arm's length	Same At 1 ft.	Accommodation	Crossed reflex
R.	Normal	4	3½	Normal	Normal
L.	Normal	4	3½	Normal	Normal

II. Patellar

R. Present normal.
L. Present normal.

III. Plantar

R. No response to stimuli.
L. No response to stimuli.

3:36 p. m.

E. R. S.: Let me give you my remote first. Just had it on my tongue's end—I can just see boys and girls there, pupils in school, in the academy, and that fitted right in with son and daughter. Can you hear me? Am I talking plainly enough?

Well, you see that made the first two pairs, I mean the first. Then the son and daughter would be talked to by the teacher, that would be sound—voice. I saw everything in the school; I saw the pupils sitting in it, and I saw the son and daughter.

(Asks if she can have all the water she wants, and is granted a reasonable amount.)

My eyes feel so funny. (Asks us to watch left eyelid.) (Later this eyelid drooped.) Mouth tastes funny. Second list was what the pupil studied. Land and water is geography; horse—carriage is transportation, so it belongs in physical geography; rise—fall of the Roman Empire would be history. Cat—dog would belong to zoology. I can see all these things and also see pupils studying out of these books. Wheel—axle worried me because it wasn't any special subject of study. I would be so glad of an excuse to stop talking. Don't know what came after horse—carriage, but am sure pupils were studying. I know. They were studying domestic science and making

hats and bonnets. Is that all of that list? I had a feeling the list wasn't long enough. That's too much for me. I think there was another subject of study, but don't know what.

Snake—fiddle. I knew a student from California studying music in Munich. He became so alcoholic he couldn't succeed at anything. That fitted in with snake—fiddle. Munich boys do lots of mountain climbing. Association. Then I came right here, and thought of this door and that box-like piece of furniture. Apron—courtyard was this doctor's apron and the courtyard of the hospital. (Hesitates.) Think it was connected with us here somehow. Was just repeating "apron—courtyard" to see if that would bring up the next thing. I connected it here with the hospital. That's all I know. Now you can begin. I saw all those things very distinctly. Better ask me how.

A. T.: *How did you remember paste—canal?*

Paste—canal, but that couldn't connect with apron—courtyard here. I say my map of Idaho. It's torn and I had to paste it. (Thinks of irrigation canals there, but doesn't mention them until later.)

Milk—paper. That was all connected with Idaho. I pasted the map and then rode past the place where we buy our milk, to Hollister, where I bought a paper.

That was vivid. I feel myself (stops).

3:30 p. m. Pulse 84.

My tongue is getting thicker all the time. I feel as if my body were going to sleep on me and the rest of me were staying awake inside. (Starts for the next room.) Come along with me and see if I snagger (means stagger). (When she came back she went on:)

I'm so limp. How funny. Doesn't feel like me. Thank you. (Tells about A. T.'s illness and tucking in her "toots.")

TEST III

3:42 p. m.

Never felt so lazy in my life.

Now I am going to tell you a story to see how well you can remember. I want you to listen carefully and when I have finished I shall ask you to tell it to me.

"A mother heard her two little boys quarreling and asked the elder, 'What was the trouble?' 'Willie is crying because I am eating my apple and not giving him any,' replied James. 'Is his apple all eaten?' inquired the mother. 'Yes, and he cried while I was eating that, too.'"

Oh! (Laughs heartily and coughs.)

"A mother heard her two little boys quarreling. What is the matter, she asked of the elder. Willie is crying because I am eating my apple. But didn't Willie have an apple? Yes, said James; he cried while I was eating that one, too."

Any more? That's a dandy story. That's all I remember.

Now I am going to ask you some questions to help you remember more about this story. What is this story about? (1.2 sec.) A mother and her two children quarreling; the elder quarreling.

Who quarreled? (1.4) The two boys.

Who came to settle the quarrel? (1.2) The mother. She came, but she may not have come for that purpose.

How many children were there? (.4) Two. Willie and James.

What was the elder's name? (1.0) James.

How old was he? (3.0) Doesn't tell.

What was the younger's name? (1.2) (Mumbles) Willie.

How old was he? (1.5) Doesn't tell.

What was the quarrel about? (2.4) Two apples which the elder one ate.

How many apples were there? (1.0) Two. (Started to say something more and didn't.)

Were the apples eaten? (1.6) By James, yes.

Who ate the first apple? (1.5) James.

Who ate the second apple? (.8) James.

Did somebody cry? (2.2) Willie cried.

Why did he cry? (1.7) Because he didn't get any. Are you writing it in longhand?

How much candy was there? (2.3) Not any candy; it was apples.

Who ate the candy? (1.2) (Sleepy tone.) Nobody. There wasn't any.

What did the mother do? (3.0) It doesn't say. (Very sleepy tone, a little thick.)

Now I am going to tell you the story again and you can tell me anything you forgot or answered wrong.

(*Story repeated.*)

I left out that the mother heard them quarreling and that she asked the elder one a question.

Anything else?

Not that I remember. (Very sleepy.) Better take a piece of paper and wrap it round that electric light so it won't hurt your eyes.

TEST IV—WEIGHTS

Test performed slowly and languidly, but correctly. Says: "My hands are so heavy; whichever weight my left hand touches seems heavier."

(Lifts her hands to show that she was through with the weights and that we could take them away. Covers up hands with blanket.)

E. R. S.: "My mouth feels so funny." (Rouses herself to meet Mrs. H. and Mrs. G., a friend who speaks Chi-

nese.) Asked if she is feeling uncomfortable, says: "Oh, no; it's more fun than a little." After being introduced to Mrs. H., repeats her name. (Another dose is given.) "This is my second dose." (Raises her sleeve herself.) "Is it alcohol? I always wondered." (To Mrs. G.) "Just a little hypo needle. It doesn't hurt a bit. It must be a very fine needle." (Smiles and then explains to Mrs. G.) "They are going to give me a psychological test." (Explains to Mrs. G. and spells scopolamine, saying it is used in Freiberg and Giessen. Talks quite a few minutes, explaining how Dr. Van Hoosen does.)

4:00 p. m. Second dose given. Morphine ¼ gr., scopolamine 1/100 gr.

(Mrs. G. enters. E. R. S. recognizes and greets her. Mrs. G. introduces her sister, Mrs. H.)

TEST V

4:00-4:05 p. m. Second Test of Orientation.

(During this test examinee lay most of the time with eyes closed. Spoke with an evident effort, but with perfect coherence.)

1. *What is your name?* (2.2 sec.) Elisabeth Shaw.
2. *When is your birthday?* (1.2) Fourth of July.
3. *How old are you?* (1.2) Thirty-nine.
4. *Where is your home?* (.8) Evanston.

5. *What year is this?* (1.0) 1915.
6. *What month is this?* (.8) January. (Voice trails away.)
7. *What day of the month is today?* (1.2) Eighth.
8. *What day of the week is today?* (.8) Friday.
9. *How long have you been here?* (2.2) About an hour. (Hesitates.) (Really two hours.)
10. *In what city are you now?* (1.0) Chicago.
11. *In what kind of a house are you?* (.7) Hospital.
12. *Who brought you here?* (1.8) You and Mrs. B. did. (Correct.)
13. *Who are the people in this house?* (1.0) Doctors, nurses and patients.
14. *Who am I?* (2.4) You're my psychologist.
15. *Where were you a week ago?* (2.8) Here, at the hospital, I think; yes. (Retrospective tone.)
16. *Where were you a month ago?* (1.8) I think I was in Evanston.
17. *Where were you a year ago on Christmas?* (1.7) Uncle Albert's house.
18. *What did you get for Christmas presents?* (2) Um—awfully hard to remember. An apron, and I got this (pointing to Chinese gown which she is wearing). Uncle Frank brought each of his nieces one from China. I don't remember. A string of

beads; that little box of pins from Mrs. R. I can only remember by thinking of separate people (*any more?*) Yes, a good deal more, but I can't think of it.

19. *Are you sad?* (1.6) No. I am having the "time of me life!" I am wondering what would happen if—Oh, dear, how they would howl!
20. *Are you sick?* (1.8) No. (Chuckling.)
21. *Why do I ask you all this?* (1.5) (Laughs.) To see how well the medicine is working. Is that all?

(To Mrs. G.) This morning was thinking about you while I was mending a stocking. It was just before Mrs. B. came. The point was that my mind was very relaxed. I mean I wasn't thinking about my work. Suddenly the Chinese "Now I lay me" came to me. (Repeats "Now I lay me" and the Lord's Prayer in Chinese.)

TEST VI

4:10 p. m. Pulse 92.

4:12 p. m. Test VI.

E. R. S.: Am just so relaxed and comfortable, delicious.

A. T. *I want you to read this over to yourself carefully once and when you have finished, give the paper back to me.* (A typewritten copy of the following anecdote was handed to E. R. S., which she read with some difficulty.)

"A package of silverware valued at $25.00 *was brought to the police station yesterday by an Italian named Morrison of North State Street. He said that the package was found beneath a sidewalk at the rear of his house. The silver was marked Messenger."*

Italians aren't named Morrison. I read part of that story twice.

Now tell me the story that you read.

This morning a package full of silverware was brought to somebody on North State Street by a negro named Morrison and the package was valued at $25.00. And the negro said he found it under the sidewalk in the rear of his house. And the package was marked "messenger." That's all I remember. (Very thick speech in two places.)

When am I going to get my third dose? I only had one. No, I have had two, one in each arm.

When did you have your third one? I haven't had that yet. Are you going to ask me any cross-questions on that story? Gee, I am glad I am through the thing. (Turns to Mrs. G.) I wonder if I could have said that Lord's Prayer before. Quite likely. I haven't thought of that "Now I lay me" before for ages. Isn't it interesting?

TEST VII—MEMORY OF CHILDHOOD'S LANGUAGE

Now suppose I tell you all the Chinese I can think of and then maybe after a while I can tell you more then than I can think of now.

I have just proved that I know the Lord's Prayer. Mrs. G. begins quoting a Chinese song and says she doesn't know the next line and E. R. S. gives it. She sings with Mrs. G. a Buddhist chant. It was suggested that her mother had had something to do with this, but E. R. S. thinks Mrs. Nevius. Then tries to sing another tune and explains that her mother had adapted it. Sings words to "Jesus Loves Me" in Chinese. Mrs. G. asks what swe da mun means (Who is at the door?). E. R. S. says, "I don't quite get the meaning." As soon as Mrs. G. hummed a tune, E. R. S. got the words correctly.

E. R. S.: Mouth is awfully dry, and I can't get my left eye open without a great deal of trouble. I had a handkerchief when I first came.

I am terribly sleepy, but I am going to fight it. (Shows handkerchief to nurses, to Mrs. G. and to me and explains that "Bessie," embroidered there, is her baby name.)

I wish I had not taken the drink of water. (Says afterwards that she felt as if she might easily become nauseated.)

Then talks more Chinese. Repeats "Home, Sweet Home," and "Yin Yin shin li," same words to two different tunes. Says that she remembers the word pao-shin-ti —that means postman. Thinks that is about all the Chinese she remembers.

E. R. S. starts singing in Chinese, "I am so glad that my Father in Heaven tells of His love in the book He has given."

Mrs. G.: *And "Precious Jewels," do you know that?* (E. R. S. looked over on the wrong side for Mrs. G., to the place where she had been sitting.)

What time is it, about 4:30? (It was 4:35.)

What was your shing? Isn't that the name? Oh, I've almost forgotten. My name was Shaw Bessie (thick tone). *Can you get the proper Chinese answer?* I don't know anything except Shaw Bessie. It's a whole lot of stuff about your being the most humble servant. It takes an hour to say "How do you do?" and two hours to say "Good-bye." *What is the polite answer?* I don't know, except that you've got to have a general feeling that you're a worm in the dust. Humble? Don't know what it is. *Goo-niang-gin-sheng.* That would be an unmarried lady. (E. R. S. repeats after Mrs. G.) I don't know. *Wo-gen-sing-sha.* Please say that again. I can remember it from the beginning to the end. My humble name? This is the business life (to

Dr. G. when she comes to take the reflexes). (Asks to be excused for having forgotten to take off her glasses before the eye reflex.) I suppose I ought not to drink.
4:30 p. m. Pulse 100.

REFLEXES

I. Pupils

Light	Size with electric light at arm's length	Same at 1 ft.	Accommodation	Crossed reflex
R. Slight	5	5	Absent	Absent
L. Slight	5	5	Absent	Absent

II. Patellar

R. Normal.
L. Normal.

III. Plantar

R. Normal. Response to intense stimuli.
L. Normal. Response to intense stimuli.

While the Babinski reflex was being given, E. R. S. mumbled something like "needle—shi—ooch. I feel like April clothes. Thank you."

(Notices conversation going on around her.) "Are you going to say something? I am all right. Falling off? (Says disinclination to talk is growing very much.) I could go to sleep now dead easy. When will Dr. Y. be here?"

Don't know what I was going to say. Don't work too hard at it. When does the next hypo come? The next will be the third. Very little idea. I want somebody to take

Dr. Y. and Miss T. When is supper? (asked to speak louder). Louder than this? My Adam's apple is all out of commission (asked if she sees two heads on the doctor). Only one head, only one visible. My hands feel very funny. That reminds me, Mrs. B., when I was taking your test on your knees—well, what was I talking about?—I haven't the remotest idea. My lips are so dry I can't smile, and that's a terrible calamity.

(Asked if likes scopolamine and why not?) No. The last tasted so metallic. I don't like it. (Asked if she would like a drink of water?) No. This isn't hydrophobia. Frightfully funny. (Laughs.) (Later says she refused the water for fear of being nauseated.)

Don't know what you are going to do. I would know that voice with my eyes shut. I'm just like the White Linen Nurse. My mouth is so dry. (Later in the evening said:) "I had struggled in vain to say, 'My noble expression aches like the White Linen Nurse.'" (Asked if the light bothered.) No. My lips are so stiff.

TEST VIII

4:45 p. m. Third Test of Orientation.

1. *What is your name?* (1.8 sec.) (Frowns, hands on eyes and laughs) Elisabeth Shaw. (Disgusted, pained expression.) I guess not. I would go to

sleep if I had that. Can you tell by my action when the effect of the medicine is at its height? (Laughs.) I don't know what. Oh, dear, it's so funny. I feel all puckered up, my mouth is so dry. (Laughs and giggles, hands on eyes and nose.) (Later says that at this time she was struggling to keep from weeping.)

2. *When is your birthday?* (2.0) Fourth of July. I feel as if part of my mouth didn't belong to me.
3. *How old are you?* (1.5) Thirty-nine.
4. *Where is your home?* (1.4) Evanston.
5. *What year is this?* (1.4) 1915.
6. *What month is this?* (1.5) Jan. I don't know why I abbreviated that. What time is it? I want to keep awake until Dr. Y. comes if I can.
7. *What day of the month is today?* (.8) Eighth.
8. *What day of the week is today?* (5.3) Friday. I don't remember.
9. *How long have you been here?* (3.4) Oh, maybe an hour and a half.
10. *In what city are you now?* (.8) Chicago (opens eyes.)
11. *What kind of house is this?* (1.2) Hospital.
12. *Who brought you here?* (No response.) (Puts hands inside of Chinese gown which she is wear-

ing.) *Who brought you here?* (1.8) I brought two other people? It's just the other way around. They are going to mail me the specifications for the ranch you told me. (*What did you say?*) Nothing. I have no idea what I was going to say. Does it seem uncanny to you all? (To Miss T.) That's the rules of the game. (Shakes hands and feels of them and laughs.) It feels so excruciatingly funny.

13. *Who are the people in this house?* (2.2) Doctors and nurses and patients.
14. *Who am I?* (1.6) Ada.
15. *Where were you a week ago?* (2.0) Evanston.
16. *Where were you a month ago?* (1.6) Evanston.
17. *Where were you last Christmas?* (1.2) Uncle Albert's house, family reunion.
18. *What did you get for Christmas presents?* (1.2) Isn't that funny? That's just what I was trying to tell you before you asked. Can't you be a little more comfortable, Mrs. G.? Isn't there another chair for you? Limp as a dish rag. Lay off some and keep the more efficient ones.

    What did you get for Christmas presents? (7.0) Miss Townsend, Miss Foster.

What did you get for Christmas presents? (7.0) (Shakes head.) I don't know. What number is that? What's the number of that question? Before the time for the next dose comes, hadn't I better slit up the back of my nightgown so you can get at my spine?

19. *Are you sad?* (1.7) No. (Shakes head.)
20. *Are you sick?* (1.0) No. (Moves head, twitches.) Where is the lid of the fountain pen? Now the second dose is given at 4:00 o'clock; then, after I scolded him. I told him I wasn't sure men were admitted—for women and children—cart wheel, I said. I know I don't know what I mean. (Laughs.)
21. *Why do I ask you all this?* (2.0) (Laughs.) (One-sided smile to left.) Perfectly coherent—seems that way to me. Did you do anything to me? Miss T.? Was it something I said? I didn't find myself to roll down Pike's Peak—and you know I know how silly. (Laughs.)

TEST IX—WEIGHTS

4:50 p. m.

A. T.: *Which is heavier?* Weights put in hands. She holds weights helplessly, one in each hand.

E. R. S.: (Laughs.) Take all I can and keep all I get. Feels so funny. (Hands on eyes constantly and still fingering bed clothes and hands. *Question is repeated.*) Did I measure this the last time, too? Now you see, this is the most uncanny thing about it all. Have taken it away. Otherwise I suspect I was near the Northwestern station. (*Repeats question.*) (Oh! Oh, that would be fine. (*Repeats question.*) Nonsense, people thought.

Can you hold that tight? Maybe. If you will promise. Oh, that's so funny. (Laughs and puts hands over eyes.) *A. T. repeats question and says, Feel them.*) But then it was all unexpected to her. I don't think silver dollars—she just has given you guesses. (Seems not to know she has anything in her hands. Rubs eyes and nose.)

(An electric light was changed in position. E. R. S. seemed to notice it and was asked what happened.) I don't know. Street car—your watch on your hand—must keep awake—yes, I do—I want to get the inside things about how it acts on you. Mrs. G. is going to give me a lot of Chinese—is that light in your eyes? Now, isn't that funny?

Mrs. G. asks: *Where did you live in Tungchow?* At the East Gate. My cousins. In Wei-hien I sent back word. Over here on the south side somewhere. Her cousin and she have always been bosom friends. Opposite in tem-

perament as can be—not going to give them as a special test—just give picture story—don't believe he's as brave as all that, is he? *Who's brave?* I don't know.

Did you ever go to Wei-hien? Yes, just passed through. Went Kee (hesitates). *What's the rest of it?* (Then E. R. S. got it correctly.) Tsi-nan-fu. *Whom were you with?* My mother. Am I worrying you any at all? All right, I will try to get loose. All tied up sitting around here. I think so. *Where was it Di-shan-sung lived?* Oh, this is a lovely question. It's just off around the corner from giving people a clearer. *Giving them what? Can't you tell me?* Oh, haven't I told you yet? Where was it running? *Was what?* Di-shan-sung called observatory. *What else?* Don't think of anything else. The bed is very comfortable. Won't have to have the screen up. *What did they do with the Gwan-yin?* That happened so long after I went away. Did they really have to tear it down? Hum. How is that? No, I mean the image. *What did they do with the Gwan-yin?* It's an hour and a half from Wendell Phillips, is it? *Don't you remember what they did with the Gwan-yin?* No. If the baby is either born dead or is (laughs)—sorry, I didn't know Mr. G. was around. There's no telling what I'll do. Does it have to be in? Now, there was one other thing I wanted to ask before I go to sleep. We are going to have two of the

Giessen tests. Then slowly, so she will get the gist of the thing. Seems to me she has really quite a lot to learn.

5:00 p. m. Third hypodermic is given. Morphine ¼ gr., scopolamine 1/100 gr.

Pulse 100.

E. R. S.: Don't think the second has come yet. Nurse: *How many have you had?* I think it's only two, but it may be the third. *What does this one make?* I think it makes the third. *Where did you have the first one?* Was it maternity business or was it purely benevolent? She can observe better if she hasn't anything else on her mind. *How many hypos have you had?* Blessed if I know. *How many do you think you have had?* I know I have had two. You are giving me one just now. *Was this the second one?* Do you want me very much for something? Oh, it's the nurse. I thought you were Mrs. G. all the time. You see, it is awfully hard to match up with the words that I may happen to remember. I strike out for something, but I am just as apt to meet something else. I feel so utterly silly. This is terrible. You see they are trying to get water on our ranches. I forgot what I was going to say. In Idaho that's my chief interest. It's my only recreation. I go to the movies only about once a year. That's my next chief interest. Please don't be too consci-

entious, because I'll scold you if you are. I had a feeling, just then, that you are one of those waxwork figures. My head hurts.

(She is handed weight in box.) E. R. S.: What is she to compare it with? I am a remarkable scopolamic reaction. This sounds as if she had a great deal.

Which is heavier? I can see things floating around over there. You know that it is an evidence of delirium tremens. (Hears some one asking about a pen, turns over in bed and points toward table.) There is a pen over here. (Correct.)

What is this? Weights. Evanston Public Library, 1944. (*Question repeated.* Changes boxes and *repeats question.*) E. R. S.: Have you asked me that before, or haven't you? When I come back I am going right to sleep on the sleeping porch. *What have you in your hand?* Weights. I might have said pill boxes. I might have said fool boxes. (Something else we could not understand.) Where were those women? There was one in Darmstadt. A whole week or ten days of it—and when we got through we were all banged up. This was meant to be so. *Which is heavier?* That lady that does such nice writing for you. Preventive, Mrs. B. *Which is heavier?* Wasn't that funny? Now I lay me down to sleep. Offensive condition, no, a friendly condition. Were you? I guess not.

Which is heavier? (E. R. S. shook hand and had it right. *Question repeated.* Shakes hand.)

Do you know Mrs. G.? Yes, I have seen her only about thirty miles to interpret her papers, do you see? *When did you see Mrs. G. last?* Saw Ethel—that firm—I wasn't provoked at anybody.

What color is Mrs. G.'s dress? (Silence. *Question repeated.*) I haven't seen the clock at all, you know, this morning. If Dr. Van Hoosen's sister and her cousin, both of whom have the governing of the thing—

TEST X

5:18 p. m.

E. R. S.: They've interlocked my fingers. A. T.: *Would you like to undo them?* Yes.

Fourth Test of Orientation, etc. (Prof. Sommer.)

1. *What is your name?* (2.0 sec.) Elisabeth Shaw (mumbles). Do we have to go now?

1½. *When is your birthday?* (1.4) Fourth of July.

2. *How old are you?* (3.0) For that number, please, I am unexpected. Make it up—away.

How old are you? (No answer.) (After about 16 minutes opens eyes and mouth and puts hands to eyes and then back to folded position on chest.

How old are you? (4.5) I am more than 75.

3. *Where is your home?* (1.4) Haven't any.
4. *What year is this?* (1.0) (Murmurs indistinguishable words.) (Picks tooth once.) (Scratches bedding with fingers.) Catholic O, ordinary American.

   What year is this? A dog—for the benefit of—and now that I put—

5:25 p. m.

REFLEXES

I. Pupils

	Light	Size with electric light at arm's length	Same at 1 ft.	Accommodation
R.	Absent	5½	5½	Absent
L.	Absent	5½	5½	Absent

II. Patellar

R. Normal reflexes.
L. Normal reflexes.

III. Plantar

R. Sluggish—slight Babinski on first Stim. Later normal response.
L. Marked Babinski on first stimulation. Normal response to repeated stimuli.

(Tries to pull dress down when doctor tries the knee jerk. Still gets reflex on both of them. Babinski decided on left and slight on right.

E. R. S.: I understand more, for instance, this medical German. Five very nice you have splendid—water lilies—I may not be able to do it immediately, but if not, sound

the stub. Published in a magazine and was never examined before (very thick).

A doctor asked: *Are you having a good sleep, Miss Shaw?* Yes, very.

Doctor: *When are you going to have your operation?* (Smiled.) Because little pitchers have big ears. You know she goes by the elevated, gets off at Marshfield station, and then there is that overground.

Do you know Chinese? Yes, that's just the beauty of it. I don't quite remember that quotation. (*She is asked to say it.*) One can do it in three minutes nearly every time.

(After this the sleep became so deep that all efforts to rouse her failed except an occasional question, and stimulation of her rote memory of Chinese. Her name was called again and again, but she made no response.)

Mrs. G.: *Let's say it again—wo-men-tsai* (beginning of Lord's Prayer). (Repeats these three words twice. Tries yin yin.) Have just come upstairs—no, half an hour or so ago—ambulance—the ambulance for carrying the thing! *Let's try wo-men-tsai* (Lord's Prayer). Sure I do. *Say it with me, then.* (Mumbles something unintelligible.) Un-yan-gen-shai—I haven't—literally. *Yin-yin-shin;* finished the line correctly. *Whan-hi-tien-tang;* E. R. S. blows out of corner of mouth. Repeats four words. *pa-di-yu.* Not

going to miss economy. Oh, Mrs. G., I wonder if I had better take the voices. (Rubs lips.) I didn't expect to have to see her. *Yin-yin-shin-li-yow-ku-fu* (repeated with E. R. S.) (Neck flexed by nurse, but made no difference; tried again.) Van Hoosen—if she could possibly strain a point—I wish you would ask her if she could.

That last sentence was the one I was waiting for. I am going to Europe for Giessen tests; how silly she is; if they were poor people they would have been requested to leave —perfectly reliable—you can trust. *Trust what?* If you could remember. Something very valuable—you know that type, don't you? Tantalizing and smiles—I believe Dr.; some time.

Would you like to go to sleep? (Blows hard through her mouth.) I am in very great comfort—so utterly nonsense she went to—(mumbles).

(Some one calls her name and asks her if she is having a good time.) E. R. S.: I am all straight except when I talk Chinese; so much worse when they—scattering attention. *Do you remember Chinese? Can you say the Lord's Prayer in Chinese? Miss Shaw, can you say the Lord's Prayer in Chinese? Could you say the Lord's Prayer in English?* Yes, of course I could. *Let's hear you, then.* I don't suppose—would be a profession with him—you can't measure the degree of testimony by—protest.

Where are you, Miss Shaw? I am at the bank. *What are you doing at the bank?* I am just taking out a charge account. What are they laughing about?

TEST XI

5:50 p. m. Fifth Test of Orientation.

E. R. S.: Perfectly fascinating—besides, I am examining.

(During this test, Dr. S., sitting at head of bed, repeated each question, as A. T.'s voice did not seem to rouse examinee, not even when words were spoken directly into her ear. Voice of E. R. S. very indistinct—exceedingly difficult to understand. She picked at something most of the time; rubbed nose and eyes; occasionally opened eyes.)

1. *What is your name?* (No response.)
   What is your name? (1.5) Elisabeth Shaw.
2. *When is your birthday?* (No response.)
   When is your birthday? More than she could. (The doctor flexed her neck and repeated the question.) (No response.) (E. R. S. looks around at people on both sides of the bed. No response.)
   When is your birthday? (2.5) Jan. 27. (Note: This is the date of the coming Congress on Anæsthesia!)
3. *How old are you?* (Moves mouth.) (No response. Mumbles and picks at hands.)

Miss Shaw, how old are you? (Doctor flexed her neck.) (No response.) (Notices that her hair is disordered and tries to arrange it.)

How old are you? (Doctor speaks louder than before.) Lively old soul. For those few days at Mrs. K.'s she simply couldn't wait.

How old are you? Well, it's this way. (Pats A. T. gently with hand.)

4. (Omitted.)
5. *What year is this?* If you are going to be in the city—mothers.

   What year is this? 1915. I said it because it was impossible that so—religious instinct.
6. *What month is this?* (Repeated four times, using her name.) Had a beautiful lesson (repeated) (deep breathing).
7. (Omitted.)
8. *What day of the week is today?* (Tries to answer, moves lips, but makes no sound.)

   (6:00 p. m.)
9. *How long have you been here?* (Moves lips.) Ever since last September.
10. *In what city are you now?* (Smiles.) I used to be troubled awfully with insomnia.

    In what city are you now? Chicago.

11. *Who brought you here?* In this particular case—a great exception, of course, but I want it to be a success.
12. *In what kind of house are you?* (Smiles slightly and tries to sit up.)
13. *Who are the people in this house?* (Smiles.) It really is worth it for that price. Nurse: *What do you see, Miss Shaw?* (No response.) Which book is this? (*Who are the people in this house?*) (Nods and smiles continuously, as if to say, "Everything is all right.")
14. *Who am I?* (Smiles.) That's pretty hard—came over this afternoon—Mary Thompson Hospital—Miss Townsend's house. (A. T. repeats question.) Follow somebody else's—for this reason. (Pats A. T.) Don't know antecedents, but they are going to operate, probably. (Smiles.)

(Questions 15 to 17, inclusive, omitted.)

18. *Are you sad?* No.
19. *Are you sick?* (Smiles.) Yes. I am so sleepy—keeping awake—let me see now—one night—just simply—I know (smiles.)

E. R. S.: They don't stop to give their own concept—telephone number 25—Freiburg—paper—I just brought—computation—to find out—I don't know. *Why are you*

sleepy, Miss Shaw? Are you sleepy? Like sixty, yes. *Why?* Because it— (*Question repeated.*) (Tries to scratch.) You should have faith that I wouldn't do that—I am mortally afraid, not of the thing itself, but that the public would misunderstand it—co-operate.

(A. T. calls "Bessie.") Yes. *Who spoke to you?* (No response.) (A. T. lies down beside her, in order to hear more easily her almost unintelligible mumblings.)

A. T.: *Elisabeth?* E. R. S.: So, after the rebellion, twenty-five years ago, she doesn't like it. *Elisabeth?* What do you put on there, time? I could help you carry things—Heller effect. *Do you know Mrs. G.?* She has been with me this afternoon. You know she is teaching three times a week—and if they should want her on Christmas this week—yes, I do—around the world very slowly—certainly if they are the very least observing—also about Dr. S. W.—have I told you about her—how did you come by 38? I want to relieve the anæmia in my head—at the same identical moment (snuggles up to A. T. exactly as if she were awake) simply do the most unexpected things you could think of—not quite that—you will have a little time—I am relying on your word memory—and mine—did you tell which floor it was on? You see, I slept there last night, so I know the situation better than people who have lived with those people for a thousand

years (told her to put her arms around A. T.'s neck, and she did it, and gave her quite a little squeeze). Lovely—I'd like to have her see how we publish this.

What color is that, over there? (White.) (No response.) *Do you know Dr. S. W.?* Have it there all safe and sound all the time. Astounding—room there—previous association—leave the package here at the door. *Do you know Dr. S. W.?* Sure. I know several languages—College. *Elisabeth, will you move over just a little bit?* Sure. (Moved readily.) *Do you know who this is?* (E. R. S. fusses with fingers.) *Who am I?* Do you mean you are taking these matters into your own hands for considerably more than half a dozen, in all probability? (Confidential tone.) Did you get it? You are awfully, awfully good to postpone—

Elisabeth, do you want to rub me a little? I would love it—I was waiting and watching for the opportune moment—now if anybody would come in I was enormously interested. *Are you sleepy?* Just a moment (mumbles). I can't thank you—I can't do it satisfactorily without—*Does your hair bother you?* (Shook head.) No. (Moves, tries to sit up in bed.) I can't imagine why a few days at home should make her impudent—now don't you get that all mixed up—if drunk, support (puts out hand to Dr. Y.). Now isn't that cunning? I needed it

down in the city this morning, but hated to carry it back and forth—however, it will come out all right.

Are you cold? E. R. S.: White—ring around the mouth—she did (laughs). I don't seem to have sense enough to father my book, but I have not got it written yet—it's only within the last few months that I have had any pleasure out of my acquaintance with them—so I am being at the hospital just as much as I can—joint meeting of the Medical Congress—you know I talked Chinese for the first nine years of my life (turns over on side). I am scared to death—you know this is Chicago, and Chicago is dirt—and you know keeping it within—those little papers of Mrs. Odell's—(reaches over and taps A. T. on the arm; makes little noises) honorable food—dear, I am scared for fear I'll sauce my hands up—just a moment, Doctor, and then I'll let you know immediately after that. 6:35 p. m.

E. R. S.: It takes number 12 (smiles). That's right (feels of ears). He'll make no objections if I discover things all up and then he'll wake him when the train arrives—meanwhile you will think of what is going to happen at the county tomorrow—now it is just this matter—a perfectly open-minded person—I know, but you permitted me once to stop you, so roll it up—the worst half of Chicago, no matter what tests or what experi-

ments—Dr. Y.—Dr. Y.—What will I do, what can I do, to get the wrinkles out of there (says this with hands on A. T.'s face) and get you rested up. (A. T. said: That means me.) E. R. S. : I know it p———. She may have an abundance of nice clothes—the middle of the long horizontal is right there—talk about problem in arithmetic—personal—sort of friendly affair.

A. T.: *Elisabeth, what is Caroline's other name?* E. R. S.: (answers correctly). Nurse: *Did you get the blotter?* Yes. *Who brought it?* I believe it was started with President C. S.—the last time I went home from the hospital— *Are you warm enough?* Oh, yes—being denied the pleasure of seeing me go under these tests and now after only a very few tests I believe Orientation and another book tells it all. (Accidentally bumps A. T.) What will I do next? (disgusted tone). Demmit, demmit, demmit—I have to catch a train—it is supposed to go at 1:22 and I think it practically always does.

(Dr. Y. rings bell.) Just a little after 7:00. (Sits up in bed and hunts for watch under pillow.) Yes, I know all about it—sapphire—I had it polished and set in a ring for goitre reduction—it was lovely reduction—I am crazy to have another talk with you and I am looking forward to it with very zestful—

About 7:00 p. m.

(We went downstairs to supper, leaving E. R. S. in charge of a nurse. As soon as we came into the room, when we came back, she stretched out her arms to us, and was sitting up, looking bright and wide awake, smiling.)
E. R. S.: I know that every night I have been coming to the hospital except one have been battles for this little white child—it has got to be convincing or not at all.
About 7:30 p. m.

(Dr. V. H. asks her what the blanket is.) Blanket. *Are you warm enough?* Yes, thank you. Are you? Not too warm? That's funny, when you are not left-handed—that isn't deft (or delft) blue, is it? Now you know the points better than anyone else in the city.

What is this? A blanket, but it's so thin, might as well be killed for a sheep as a lamb. *Do you want to lie down?* I wish we had twin beds—as soon as the parents began to realize that I was a simple enough individual, it began to be interesting.

(E. R. S. recognized Mrs. B. and then said to A. T.:) Not sure that business is best for her (some lost here). Just what I wanted. I want a typist—I want all rubber and hardware handled—always have my watch here—the doctor that's going to give me this twilight sleep has done it in 5,278—Chicago attempts at pronunciation of foreign names—she is just on the crest of the Ravenswood just

now—I am not testing for the quantity of memory registered—just three or four Orientation—reach me your—we want a substitute for the Fall River Bank. *Who do you think you will get?* I am exceedingly interested. (Flashlight explodes.) (Asks Dr. Y. if light isn't too strong on her.) *What makes you think that the light is too strong?* Because your mouth twitches, has a headache in the back of her head, but I think there will be no complications—I just sort of feel as if I belonged—I remember a large part of it. But there is apt to be sleep—I don't think they will have that particular kind of army.

(Just here E. R. S. decided she ought to go home.) Got them at a time when Florence was in a very bad condition. That's what Mrs. Reuf said she wanted for a memorial to her son—these things that bolster up your enthusiasm and on the other hand keep you from (looked in somebody's mouth)— Q.: *What do you see?* I saw your mouth and very little else—that is very characteristic and what you would expect from a lifelong ruler.

What is that? A Marshall Field advertisement, Fashions of the Hour. (Measured A. T.'s width of head and length of nose.) In a large percentage of the cases I have been watching are drinking too much—very familiar physician—another doctor from the west side, her name is Harrison—you know her.

(Dr. Y. gives her quinine.) *What is it? Do you like it?* I am too tired to like it yet. *Did Dr. Y. give you anything in your mouth?* No, not yet. She told me to shorten my working hours in the actual examining—I don't like people spoiling—I don't see any reason why there should be nassness of the skin—I wanted to see Dr. Y. because she knows me so well and she is one of the most famous operations in the world.

Dr. V. H. explains how we came by the name "scopolamine." At the end E. R. S. said: Well, then, where shall I meet you?—a splendid one for inference then.

(Dr. Y. sticks her finger with a pin until the blood comes. E. R. S. is looking at her. Dr. Y. explains that she wants to make a little blood test.) *Does it hurt?* E. R. S. : Not much—all right now. *Do you want a drink?* I think I had better not take a lot, but I would like to have it around. *Why?* The scopolamine might deteriorate. It does often. Is that basket all full of things to sprinkle on me? What did you throw away? Congratulations, mixed in very strongly with my confidence. My dear, the baker's boy himself wouldn't have stolen a bun—how perfectly silly.

A. T.: *Don't you want to tell me something about your sub-conscious self?* E. R. S.: Not before all these people—if you people are here I will just go about the business of

life at the other extreme—good night—Hyen-tsai-woa-yow (Now I lay me)—it isn't 12:00 yet (looks at her watch). She is going to get on at Dempster Street—a thousand thanks—and Caroline really is consenting to the fact that—to go on a bust and get all cut up—if you are not going away too soon—did Caroline give you back the old talks—deliberately taught to her—this stream of phantasies—lack of inhibition if writing premises—it is sometimes embarrassing when they get balled up in their correspondence and duties.

Don't you feel a little bit tired? Terribly; dreadfully tired for the last three weeks—I can't get used to—at Mrs. Tufts' house, 620 University—where is Miss Townsend? Away for the afternoon for some missionary meeting—school pupil, between 90 and 99 in all her studies, but her schoolmates simply could not stand for it—I must go. Tomorrow morning I am going up to Evanston.
About 7:40 p. m.

(E. R. S. was given raw quinine on tongue.) E. R. S.: Feeding the birds—now if I might have that glass of water, please, I want to get this bad taste, metallic. *What is it?* Scopolamine, and she gives it in bigger doses, oh, a combination of sweet and bitter—very dry, not exactly thirsty. There is a difference between being thirsty with every muscle and nerve crying out—extraordinary size of

hats—I am going to miss my train if I don't go. May miss my train now. (We told her the train had gone.) I don't care a hang for your hold. (Told her there were no more trains tonight.) Is that so. Well, how astounding.

TEST XII

7:45 p. m. Sixth Test of Orientation.

What is your name? The same words, don't you see, that I gave you for this preliminary test. (Turning to Mrs. B.) You don't need to write that, of course. I am absolutely sizzling with curiosity as to what is going to happen. The consensus of opinion seems to be that it is perfectly safe. Did you get the newspapers? Well, then, let us go. (Told that train has gone.) Oh, you belong to the Ananias Club.

1. *What is your name?* (.8 sec.) Elisabeth.
2. *When is your birthday?* (.8) Fourth of July.
3. *How old are you?* (1.8) She says when people go away.
3. *How old are you?* (2.0) Thirty-nine.
4. *Where is your home?* (1.6) Chicago.
5. *What year is this?* (2.0) (Points to ceiling.) I certainly have a jag on. It's a teeny little thing running around in water—loveliest thing you ever

saw—the way she learned—Cascarets—do you know what I mean? I am not at all sure. Mrs. B. will think we are entirely uncivilized. (Note: This word Cascarets was intended as a joke, to express the fact that A. T. was working while E. R. S. had the twilight sleep.)

6. *What year is this?* (1.5) I want to catch that train. What's the State Land Commission for if they can't wake us up in the morning! It wouldn't take much time or strength to run.

6. *What year is this?* (1.0) 1914—No, 15. (Asks Dr. G. to sit over closer.) Sit tighter, please.

7. *What month is this?* (2.0) January.

8. *What day of the month is today?* (2.4) Eighth. I am worrying, incidentally, all through this for fear they won't have the proper kind of dinner—guests—would like to be a saleslady; would like to perform, oh, all sorts of things—dead sure we have missed that train. Now, if I weren't a Presbyterian you would hear something from me just now!—if there is any sleep in me, I will—these little squares and things and label them all and you will be world famous and that's all there is to it.

8. *What day of the month is today?* (1.3) I told you that once. I am awfully sorry this came on a Friday. (Why?) Well, perhaps I am prejudiced, but one street down here that I have to take oftenest has no intermission. I have not answered your question and I know I don't know what the question is.
9. *What day of the week is today?* (1.8) Friday. I have told you three times. I am past-master at the art of making faces. Why can't I get to that hospital—just telephoned. Why didn't you tell me so?
10. *How long have you been here?* (2.2) In this house? An hour and a half. May be—may be much less—sum total of righteousness inside.
11. *In what city are you now?* (.8) Chicago. I am enormously wide awake—I have been before for——
12. *What kind of house is this?* One-sided frame. Say, honey, may be I have got delirium tremens. Look at that chap swimming. I'd like to be able to swim like that! Oh, see those jerky jumps! A. T. : *What is swimming?* Why, it's a tadpole, the prettiest little thing, swimming down a beautiful ravine. I am distressed at not being at

this moment at the Northwestern station. You see, she wrote me about it three weeks ago. (*Who did?*) Dr. W. is for children's diseases.

13. *Who brought you here?* (2.4) Brought myself.

14. *Who are the people in this house?* (2.0) Tell me the dream and I will interpret it for you. I am hanging on to the previous question, so put a blue——

14. *Who are the people in this house?* (1.8) Hedging again. Now isn't that funny!

14. *Who are the people in this house?* (2.2) Nice people. Truly, I have got that girl on my mind. She is about to be married and just got me a new address book. I am going to weed out some of these. I have absolutely no distinction as to which nation is friendly or unfriendly to us. If I had intuitions I wouldn't use them because it is so unscientific.

15. *Who am I?* (4.7) A lassie. (Smiles and reaches out hand to examiner.)

16. *Where were you a week ago?* (2.4) In the—— loop. I don't know just how he manages it. He has a pretty office in the loop. I guess I meant Rosie or something like that when I said "look." I promised that young girl I would be there, at

the Northwestern station. (*Telephoned her,* we said.) That's dear of you. I am getting crosser every minute about the writing. Will have to do as the three sleepers of Bonn did—morphine makes it itchy.

17. *Where were you a month ago?* (1.4) Evanston.

18. *Where were you last Christmas?* (1.0) Uncle Albert's.

19. *What did you get for Christmas presents a year ago?* (1.4) I have already told you three times. The girl ought to have more physical exercise, swimming or some good stiff physical exercise, etc. Business men like to do that sort of thing and progressively bind a girl to them. Just when did you telephone Mrs. K.?

19. *What did you get for Christmas presents a year ago?* (7.2) (Laughs.) (Whining tone.) What is the matter? It's that blamed big spider. And I have delirium tremens. Were you absolutely sincere? Is it a boy or a girl?

19. *What did you get for Christmas presents a year ago?* (9.5) (Hands on eyes.) I can tell you lots of things I am going to do. Going to build more dotted Rufus maps, dotted all over the country. C. is going to be a peculiar proposition.

19. *What did you get for Christmas presents a year ago?* (3.4) Comb and brush, paste map or map paste, I don't know which. Now, either you have put that up to fool me, or it is moving. (Laughs heartily.) I don't believe I had another birthday this year. May be I am not born yet. Now, I am lost—no idea what I was going to say.
20. *Are you sad?* (1.0) No.
21. *Are you sick?* (.8) No.
22. *Why do I ask you all this?* (3.6) (Sighs.) Perhaps to begin practicing all the labor-saving devices you can get hold of. That isn't well done.

(Finished this test at 8:10 p. m.)

(Dr. Y. gives E. R. S. ammonia to smell.) E. R. S. : Ammonia. (Held to nose again. *Are you sure?*) Well, it's diluted, I couldn't stand it that way if it weren't, could I? (Rises of her own accord. combs hair over by dresser where it is dark and finds pins and combs without help. Talks about cerebellum, while doing hair, and process of elimination.)

E. R. S. : And when she gets on a blue dress, her eyes are like a scrap of the skies. And the scopolamine increases her color. (Remembers combing her hair.) I thought there was some sort of distaste in my mind. You

know I was brought up to believe that dancing, card playing, etc., are wicked. My mother would have been exceedingly distressed—I sent you a book, didn't I—Mrs. Newman—Mrs. Ferguson—does um's head ache—there is always a cause for that—there usually is a dollar bill floating around over there, in the suitcase, in the lid of the suitcase.

8:25 p. m.

How long do you think you have been here? (1:22) Must be just about 4:00, and that spider is crawling. (*Q. repeated.*) Just off and on. You can't measure it any more than a Methodist minister. (Keeps constantly asking Mrs. B. if she is going too fast for her.) Eleanor L.—crawling again. (*Are you afraid?*) Not a particle. Would rather have the deceits in the open. I did not quite understand the question. (*Q. repeated.*) A whole lot of words—I'm simply dying to comb my hair and I can't get it out of my system that it's done.

8:30 p. m. (Told Mrs. B. a story about a college boy, who said that every morning he sprinted around the athletic field closely followed by a shower bath. Forgot the story in the middle, but the word "dean" resumed it.) Professor Burger told me, but I don't know whether he saw it himself or—what was I talking about anyhow?

(Asks about Mrs. G., what became of her, why did

she go?) She didn't do a thing for me. Do you remember? Wrong—school teacher—now I am getting all mixed up with land water in the first act—hat bonnet—not tone voice, but maybe it was voice (gone again) very particularly beautifully furnished chapel. (To Mrs. B.) I don't know as I would put that down, as opinions might differ. That's really esthetic. Oh, dear, I wanted to see Mrs. G. Memory for past events and memory for recent events. You don't have trouble with either, do you?

How are you feeling? Fine. He was here about an hour ago. Don't notice them at all. *Are you talking about Rufus or some name like that?* I don't know what I am talking about. I sort of want to laugh and cry at the same time. (Mumbles—pictures.) I dislike Corot. I love Inness, and the more modern pictures are more likely to taste stale. Before an Inness I could gaze myself away to everlasting bliss. Couldn't I tell you, to save time—indicate what you were talking about. What was the question?

I have no consciousness of having been out of this room—suggestive question—I won't fall to it.

(Tells story about a woman who got up and walked down the hall and when asked what she was doing, said, "Taking a little exercise." Obstetric case.) Am planning to sleep most of the time from now until Monday morning

so as to have full internal evidence. I have been so tired all fall and am looking forward with great pleasure to a couple of days off with enough medicine to keep me from worrying.

(Says something that shows she remembered walking in middle of street as we left Evanston coming to the hospital—transfers prick idea to the ear—recalls teacher pupil; tone voice; hat bonnet. Was tying muffler and asks A. T. if she will have it dried. Tells about its being stolen in Mary Thompson Hospital. Remembers basket and telephone used previously in test in wrong place.

Dr. Lilian J.—Oxford College—I attended—before there was instruction at the place across the river—Poughkeepsie—that's where I lost the thread before—(recalled by mentioning the doctor's name.) This hasn't had the third dose yet. (Says she knows it was in arms by muscle memory.)

(Remembers Dr. Y.'s Christmas card. Says that she has no distinct memory about sending card to Dr. Y., but is very careful to lock the front door.)

I don't know what we are talking about. Is it a piece of matting on the main mast? Tall sails—Egyptian boats on the Nile—not interested—name beginning with K. or something like that. (Later explains that she was trying to remember the name of those little boats on the Nile

called Dahabiyeh. (Tries to tell a story about a conductor, says) Voice of the people, even Dr. Evans. (Gone again.) Mary Thompson is mentioned and she begging over again. (Gone in a moment.) Isn't it maddening to start a sentence and break right down in the middle?

(Says) Metallic and horrid—(remembers bitter dose.)

9:00 p. m.

(Buttonholes Mrs. Brown when she sees her about to start for home—thanks her, and by seeming to try to think very hard remembers the things she wanted to tell her—that she is worried about the typewriting—that she wants help to learn how to write; fear that she might die before she gets her work on paper and can teach it to some other people. Unanswered letters accumulating worries her. Then talks to me about the spider. Explained that it is a gas-jet and she says: "Yes, I know it is." Asked her if she had ever been afraid of spiders. E. R. S. told story about dream when she was a little girl, beetles climbing up her stocking and sticking her—thinks she may have been afraid of spiders and tells about fight between toad and snake on wall of Buddhist monastery—they fell off the wall and dropped on her. Then asks why the light has just been turned on. Explained that the light had been changed. E. R. S. says that she sees an orange

halo about Mrs. B.'s head, and then she reasons a bit with herself and decides that it is simply a matter of attention.)

9:15 p. m. End of stenographic report.

After this time the effects of the drug began to wear away rapidly. The talk grew steadily more coherent, more connected. Examinee insisted upon combing her hair again and was able to do so with very little assistance, laughing heartily at her difficulty in standing and controlling her bodily movements. She had entirely forgotten that her hair had been combed within the hour. She recognized every one who came into the room, calling them by name and laughing gleefully over her experience. By 10:30 o'clock she appeared perfectly natural, excepting for the dilated pupils and a marked tendency to forget the thread of discourse in the middle of a sentence. Again and again she would start to make some disclosure concerning her experience, stopping suddenly with a bewildered air and asking: "What was I going to say." Patient repeating of the previous conversation would usually remind her of the interrupted idea, and she would complete the intended sentence, remembering perfectly after the connection had been made what she had intended to say. About 11:30 o'clock Dr. Van H. and Dr. S. came into the room, and the three held a long and animated conversation, making arrangements for a report upon the experience. E. R. S.

remembered most of the details of these plans, but forgot a few of them. By 11:00 o'clock she was able to stand and walk about, seeming to have full control of the muscles and of all her faculties, excepting for the inability to remember the beginning of an idea.

Remote Ranschburg the next morning.

TEST XIII—(REMOTE MEMORY OF TEST II)

About 7 a. m., January 9th.

E. R. S. I think I can remember the fifteen pairs of words. (Says them all except paste—canal, which she remembered as paste—map. Gets them all in correct order.)

TEST XIV—(REMOTE MEMORY OF TEST VI)

11:50 a. m., January 9th.

E. R. S. Now I can remember how the story looked on the page, but only as individual words. I can't remember any sense, although I realized at the time that the words made sense. In fact, I grasped the sense of one phrase at a time, but could not remember the meaning of any one phrase long enough to finish the sentence. My principal mental content so far as I now remember was a conscientious feeling that I must let you know that I

had read part of it twice. I really cannot remember anything else about the story.

(Stimulus word given "Italian.")

Oh, the Italian boy was named Anderson or some perfectly un-Italian name. That's all I know. ***That's the thing you commented on.*** Yes, I remember now my utter disgust at the incongruity of the name with the nationality. Was it Anderson? *No.* Did it begin with A? *No.* Was it Jones? *No.* Then I don't know at all. I know where I got the Jones, though, from the James in the other story!

(Second stimulus "silverware.")

Why, a negro hid the silverware under his back steps. (A. T. smiles.) No, a negro found the silverware hidden under the back steps. I don't remember what the Italian had to do with it. (After some conversation the stimulus word "messenger" is given.)

Oh, I remember; the package was marked messenger.

TEST XV—(MEMORY OF TEST III)

8:27 p. m., January 11, 1915.

(Retells all the points of the story correctly. Answers to cross-questioning as follows):

1. *What is the story about?* (2.7) Willie and James.
2. *Who quarreled?* (2.6) Willie and James.

3. *Who came to settle the quarrel?* (1.1) The mother.
4. *How many children were there?* (.8) Two.
5. *What was the elder's name?* (.7) James.
6. *How old was he?* (.9) Doesn't tell.
7. *What was the younger's name?* (.9) Willie.
8. *How old was he?* (1.1) I don't know.
9. *What was the quarrel about?* (1.0) Apple eaten by James.
10. *How many apples were there?* (.7) Two.
11. *Were the apples eaten?* (.5) Yes.
12. *Who ate the first apple?* (.5) James.
13. *Who ate the second apple?* (.8) James.
14. *Did somebody cry?* (.5) Willie did.
15. *Why did he cry?* (.5) 'Cause both apples were eaten.
16. *How much candy was there?* (.4) None.
17. *Who ate the candy?* (1.6) Nobody.
18. *What did the mother do?* (.5) The story doesn't say.

REACTION TIMES

Case X. *Orientation*	Lowest	Highest	Most frequent	Av. bona fide ques.	Av. sug. ques.
Test I 1½ hours before dosage	.4 sec.	6.6 sec.	1.4 to 1.6 sec. (6)	2.19 sec.	
Test V immediately after 2nd dose	.7 sec.	6.8 sec.	.8 to 1.0 sec. (6)	1.85 sec.	
Test VIII 45 minutes after 2nd dose	.8 sec. (2)	5.0 sec.	1.4 to 1.6 sec. (7)	1.77 sec.	
Test XII 2 hrs. 45 min. after 3rd dose	.8 sec. (5)	4.7 sec.	.8 to 1.0 sec. (8)	1.89 sec.	
Story Test III 42 minutes after 1st dose	.4 sec.	3.0 sec.	1.0 to 1.2 sec. (6)	1.33 sec.	2.10 sec.
Test XV 3 days after dosage	.4 sec.	2.7 sec.	.5 to .7 sec. (7)	1.06 sec.	.83 sec.
Case A. *Orientation*					
Test I 2 weeks before dosage	1.2 sec.	6.0 sec.	1.7 to 1.9 sec. (6)	2.31 sec.	
Test III 15 minutes after 4th dose	1.1 sec. (3)	25.1 sec.	1.1 to 1.2 sec. (5)	3.27 sec. Average without slowest reaction 2.12 sec.	
Case F. *Orientation*					
Test I 15 days before dosage	1.3 sec.	7.4 sec.	1.3 to 1.5 sec. (5)	2.78 sec.	
Test IV 15 minutes after 5th dose	1.0 sec.	7.9 sec.	1.8 to 2.0 sec. (5)	2.51 sec.	

SCOPOLAMINE-MORPHINE ANAESTHESIA

Introspections on Case X

Friday, January 8, 1915.

3 p. m. *First hypo. The prick caused no pain, perhaps because my mind was preoccupied at the moment. Was surprised at absence of pain.*

Note: This being true, a pin prick in ball of finger was probably not an adequate stimulus to test pain reaction in this individual, as her nervous system was evidently not easily irritated by such a slight stimulus. Has had lifelong training in disregarding slight irritations.

3:15 to 3:20 (time guessed). *My hands begin to feel heavy and lips to feel stiff. I am astonished at feeling effects so soon. The difficulty of speech rouses my sense of humor. I laugh uncontrollably, have to give conscious attention and effort to the formulation of each word. Am conscious that without such effort my words would not express my ideas, and the absurdity of this intensifies my laughter. I am surprised to be so clearly aware of the beginning of aphasia while still able wholly to suppress its external symptoms.*

Note: Speech is still perfectly distinct. This is during the test II, and the taking of reflexes.

After this I gradually lose the ability to estimate time. Am uncomfortably conscious of a few elemental emotions:

First, embarrassment because my teeth have not been

brushed since luncheon, hence I cover my mouth while laughing.

Second, discomfort because my hair had not been washed recently.

Third, suddenly I feel a wave of intense grief rise up from the subconscious which almost causes me to break out in convulsive weeping. I realize calmly that this is a residuum of unexpressed emotion remaining from the time of my mother's death, when I refused to wear mourning or to let myself grieve. I cover my face quickly with both hands and succeed in suppressing the impulse after a hard fight lasting until after the second dose. The motive for suppressing this emotion was a clear realization that this is one of the individual variations which the present experiment was especially designed to eliminate. During this time I laughed a great deal. None of the observers for a moment suspected the presence of the emotion.

NOTE: These emotional reactions are purely individual, largely dependent on past experience. In this case the first two emotions were rather foreign to the individual's natural temperament, but were induced on this day by something which occurred that morning—a laughable incident connected with a person who was also present at the hospital during this experiment.

I remember practically all of the story told to me (Test

III) *and quite all of the list of thirty words* (Test II) *given me to memorize, but the typewritten story which was given into my hands for me to read* (Test VI) *was almost impossible for me to comprehend, even while I was still looking at it. I glanced back and read part of it a second time, then realized that this was probably contrary to the rules of the experiment, so I promptly confessed what I had done. My immediate memory of this story was very hazy and I forgot it—forgot that I had ever seen it—immediately afterward, and when afterward reminded of it I only remembered the general appearance of the sheet of yellow paper—the general location of the typewriting on the page.*

NOTE: If these tests had been given nearly at the same time they would give valuable evidence as to the onset of alexia and auditory aphasia. This subject happens to be strongly eye-minded, hence the great contrast between the retention of auditory material and amnesia for visual material is surprising. The enlargment of pupils had begun, but not enough to interfere with the mechanical act of reading separate words. The difficulty was doubtless caused by a benumbing or dissociation of the visual association area concerned in comprehending the meaning of words seen—that is, true alexia.

After a very hazy interval I remember the entrance of

Mrs. G. and Mrs. H., have a vivid memory of both their faces, and of my introduction to Mrs. H., whom I had not met before; remembered her name without any difficulty. I think my effort to keep from weeping ceased at this interruption, and I felt great relief and became keenly interested in the progress of the experiment. I had given myself previously a strong autosuggestion that I would talk Chinese when Mrs. G. came, but I realized that Miss Townsend had been on the verge of giving me an orientation test, so I asked Mrs. G. to wait until after that. Afterwards I succeeded in telling Mrs. G. most of the Chinese poems, songs, etc., which I remember by rote, but did not succeed in conversing at all.

NOTE: This autosuggestion was given to test the possibility of reviving a long-forgotten language during the semi-conscious state produced by the drug. It was suggested by the fact that two of the patients previously examined had spoken their childhood language after becoming unable to speak English. This autosuggestion brought out very little more Chinese than could otherwise have been spoken by this individual. In fact, the unconscious utterances throughout the whole experiment were, with perhaps one exception, based on recent objective experiences.

I remember the departure of Mrs. G. and Mrs. H. and

my amazement at their going so soon. I thought they had just come. Was bewildered when they told me it was 6:00 *o'clock. I thought surely it was not more than* 4:30. *When Dr. Y. and Mrs. B. went I came to consciousness suddenly and was again amazed and incredulous when they told me it was* 9:00 *o'clock, as I thought it was still* 4:30.

NOTE: This total unconsciousness of the lapse of time is in striking contrast to this individual's habitual and carefully cultivated ability to estimate how long she has slept, during natural sleep.

My other memories of this interval before Dr. Y. went are vivid but fragmentary. I have no idea in what order they occurred. The flashes of consciousness included a fully normal breadth of mental content, minus only the sense of the passage of time. I note them in the order in which they occur to me.

(a) *I remember seeing and hearing a flashlight, and thinking, "Is it possible they are trying to take a photograph in such a crowded room?"* (Note: Actual time, 7:45 p. m.)

(b) *I remember Dr. Y. feeding me some cylindrical scraps of white medicine on the tip of a spoon. It tasted slightly metallic, but I reasoned that the scopolamine might have caused a bad tasting mouth. I did not dream that*

the medicine was quinine. (Note: Time, about 7:40 p. m.)

(c) *I remember one long, keen scratch on the sole of my foot. The sensation was such that I inferred it was done with the point of a long, black hatpin. Without looking to see if this imagination was correct, I said, "Ouch, that hurts," and thought, "What rotten technique to test Babinski with a hatpin!" then instantly went to sleep again.* (Note: Time, 5:30.)

(d) *I remember standing by the bureau combing my hair, with Miss T. steadying me. I was staggering and somewhat afraid of falling, but was greatly amused by the resemblance to inebriety. I have been told since that I combed my hair twice, but I remember only once. I do not remember going to the bureau, nor going back to bed again.* (Note: Time, about 9:15.)

(e) *I remember once trying hard to get up to go to the railroad station, while Dr. V. H. and two other people prevented me. I could not understand why they would not let me go.* (Note: Time, about 7:40.)

(f) *I remember the spider on the ceiling distinctly, was not afraid of it, but was amazed that the nurses did not bring a broom and sweep it down. Part of the time there were two spiders of equal size about one foot apart. They not only moved from side to side on the ceiling, but seemed to spin down on a thread about a foot from the*

ceiling, then to fall about half an inch, then climb up the thread to the ceiling again. I found it hard to believe that these were merely the stub of one lead pipe. (Note: Time, about 8:25.)

(g) *I remember at one time I could not see a whole face, but only one feature at a time. I recognized Dr. V. H.'s mouth in the midst of a dark blur.* (Note: Time, about 7:30.)

(h) *The only really distressing part of the whole experience was when I repeatedly found my fingers or elbow sticking into people's eyes. The eyes seemed quite detached features except when I accidentally touched them.* (Note: Time, about 6:40, and again at 7:45.)

My next memory is of waking as refreshed as if it were morning, and wholly conscious of my surroundings. I was alone with Miss T. and she said it was 10:30 *p. m., but I kept involuntarily saying "yesterday" for the preceding events, and "this morning" for the present. Dr. V. H. and Dr. S. came in, and talked to us, and I thought of many interesting things to say, but was constantly interrupted in the midst of a sentence by inability to remember what I was talking about. When given a cue word I could usually finish the sentence, if it were not too long; otherwise I got off the track again and had to be given another cue before*

I could go on. Each moment's mental content was complete and rational, but faded as if "writ in water."

In order to analyze or even to observe accurately such complex phenomena as these, one should be not only an experienced clinical psychologist, but should be deeply versed in the psychology of dreams, of somnambulism, of inebriety, of autosuggestion; of paralogia, aphasia, alexia, and agraphia; of apraxia, astasia and abasia; of illusions, of fixed ideas, of flight of ideas; and especially of the many different kinds of memory, including the typical psychopathic forms of partial amnesia, in which one kind of memory is lost while other kinds of memory are unimpaired.

Moreover, this psychological insight should be combined with an intimate knowledge of what is at present known concerning the central nervous system—with the ability to classify functional abilities and disabilities according to the anatomical area or path probably involved, whether spinal, medullar, cerebellar, thalamic, or cortical, and the chief cortical localizations.

The technique of testing should be of clinical simplicity and practicality, but should be applied with laboratory accuracy, otherwise the labor will be worse than useless, it will be in danger of leading to false results.

SUGGESTED PROBLEMS FOR STUDY

1. What is the simplest possible technique which will

adequately test reflexes, and the briefest and most convenient method of recording the same?

2. What is the simplest adequate technique for testing and recording mental phenomena?

3. Which parts of the nervous system are affected, and in what order?

4. When questions are answered irrelevantly, is it from inattention, or auditory aphasia, or inability to remember the question, or preoccupation with preconceived ideas, or is the correct idea perhaps in mind but its expression prevented by motor aphasia?

5. What are the effects of voluntary autosuggestion and of conscious expectation of what may happen during anæsthesia, and what are the limitations of these effects?

6. What are the effects of involuntary or subconscious autosuggestion—of deep seated fears, worries, and inhibitions—and how may these be kept from interfering with successful analgesia? Could some mild and expurgated form of Freudian psychanalysis beforehand prevent some of the occasional cases of excitement and resistance during the "twilight" condition, and thus obviate the necessity of supplementing the treatment with chloroform or ether?

7. What is the progressive effect of the treatment on reaction-time to auditory, visual and tactual stimuli? In what order do sensory disturbances appear? To what

degree are these disturbances of cortical origin and to what degree are they caused by changes in the end-organs of sensation?

8. When is the beginning and what is the order and rate of progress of motor inco-ordination in different muscle groups? Are the large fundamental or the finer accessory muscles first affected?

9. To what degree is indistinct articulation due to a stiffening or thickening or dryness of the muscles of speech, or is this phenomenon caused wholly by disturbance in the nervous apparatus for the control of these muscles?

10. Are optical illusions during this treatment caused wholly by the functional disturbances in the eye muscles, or are they partly ideational? To what extent are they influenced by past experience? To what degree are they based on actual objective stimulus, and to what degree do they consist of associated phantasies? Do they come during a stage of rather active ideation, or during the stage when the field of vision is narrowed and the ideas are few?

11. Are there areas of unequally diminished sensation on the skin, as there are in the deeper structures? If so, do these correspond with the distribution of endings from certain nerves, or are they more like the areas of sensory disturbance sometimes found in hysterical cases?

12. If silence does not always prove unconsciousness,

and active intelligent speech does not always register itself in the cortex, even deeply enough to be remembered a moment later, what shall be accepted by investigators as an adequate test of consciousness? If the taste of raw quinine is described as "about as bitter as horehound candy" and if a mother at the moment of childbirth asks calmly, "What is that funny feeling?" what shall be considered an effective degree of sensory consciousness?

In conclusion, I wish to express the most sincere thanks to those without whose co-operation this study could not have been made. The taking of reflexes was done by Drs. Conn, Kacin, Gardner, and McCann of the Mary Thompson Hospital; the psychological tests on myself during the experimental anæsthesia were given by Miss Ada Townsend of Northwestern University; the tests of sensation were given me by Dr. Josephine Young of Rush Medical College; the recording of my reactions was done by Mrs. Leila Love Brown, who was private secretary to a three years' scientific expedition around the world; the experiments on my ability to speak my childhood's language were given by Mrs. Samuel B. Groves, formerly of Tungchow, China.

Finally, it should be understood that all the phenomena here recorded occurred in connection with the dosage prescribed by Dr. Bertha Van Hoosen, which is so different

from that used at Freiburg that quite different results may be recorded by experimenters who study the mental effects of the original Freiburg method.

I believe that not only Dr. Van Hoosen but everyone else concerned in this study has conscientiously refrained from drawing any dogmatic conclusions from the insufficient data so far collected.

The mental phenomena observed have proved more complex than a study of the medical literature of the subject had given us any reason to expect. Hence this report is offered as a contribution to the technology of determining individual variations under the treatment. It aims to suggest a means of increasing alertness and accuracy of observation relative to mental phenomena, and to influence as many observers as possible to adopt a uniform technique.

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